Pests

AND THEIR CONTRO

1943

JUYL

VOL. 11 NO. 7

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EDITORIAL

Prof. Wesley Pillsbury Flint

Wesley Pillsbury Flint, Chief Entomologist of the Illinois State Natural History Survey and of the Illinois Agricultural Experiment Station, died suddenly of heart attack at his desk, Thursday morning, June 3. Professor Flint was 60 years old, having been born at South Hampton, New Hampshire, May 4, 1883. He graduated from the University of New Hampshire in 1906 and was with the Massachusetts Gipsy Moth Commission and the H. L. Frost Company before becoming connected with the Office of State Entomologist, a predecessor of the Illinois Natural History Survey, in November, 1907. Since July 1, 1917, he had been Chief Entomologist of the Survey and since December 1, 1930, of the Illinois Agricultural Experiment Station.

He was a member of the following scientific societies: American Association for the Advancement of Science, Entomological Society of America, American Association of Economic Entomologists, Crop Protection Institute and Illinois Academy of Science. He was president of the American Association of Economic Entomologists in 1933 and an honorary member of the National Pest Control Association.

Flint was a national authority in Economic Entomology, having published many scientific and economic papers as bulletins and in trade and scientific journals. He was co-author of Destructive and Useful Insects, by Metcalf and Flint, one of the outstanding books on economic entomology.

Professor Flint was a strong supporter of the pest control industry and was known to many in the industry, having attended and taken part in conventions of the N.P.C.A. and P.C.O. Conferences. To those who knew him he was known as a kind, helpful, energetic, dependable and cooperative associate. He was very active in work of the American Association of Economic Entomologists and was a strong supporter of the pest control industry. His loss will be greatly felt by entomologists everywhere and by commercial pest control industry.

E. E. Edwards

The sad news reaches us that Mr. E. E. Edwards, founder and president of the General Exterminating Company, Indianapolis, Ind., died on May 29, after a long illness. Stanch member of the N.P.C.A. prior to his fatal onset, Mr. Edwards contributed materially to the success of the Indianapolis convention in 1940. Always co-operative, outspoken and above all sincere, Mr. Edwards won the respect and friendship of his fellow operators and members of the entomological pest control service profession.

Surviving is his wife, Mrs. Edwards, to whom we extend our condolences and sympathy.

"Bobbie" Laing

"Bobbie" Laing, son of the late Robert W. Laing and Mrs. Robert "Pat" Laing and brother of Barbara and Helen, of Cleveland, died suddenly on June first. To "Pat" and her daughters, Barbara and Helen, who have had more than their share of tragedy stalk their family recently, we extend our sincere sympathy. We are certain that, despite their overwhelming loss, they will continue to carry on as capably and as bravely as they have done since their highly respected and universally liked husband and father passed away last year.

By Way of Correction and Explanation

IN calling into question the statement that "rotenone is now being manufactured synthetically", which appeared in the article, "Chemicals Used in the Pest Control Industry" in the April 1943 issue of "Pests", Mr. R. N. Lindabury has been of service.

After the question was raised, C. A. Vincent-Daviss, chairman of the Technical Committee of the N. P. C. A. which sponsored the article, made a careful checkup which revealed that every pound of rotenone sold at present is derived from natural sources; none synthetically. Parenthetically however, Mr. Vincent-Daviss explains that since the composition of rotenone is definitely known, there is no reason why some day it should not be produced synthetically.

Of correlated and explanatory import are some of his further remarks, here quoted: "On referring back to the many drafts of the article which finally appeared in "Pests", I find that unfortunately there was a change in terminology which has led to the erroneous statement. Originally the reference to rotenone occurred as "roteone can be synthesized" which referred specifically to the complete knowledge of its structure."

Credit and thanks to Mr. Lindabury for his helpful observation, and to Mr. Vincent-Daviss for his painstaking effort to allay whatever erroneous impression may have been created by the statement.

Vogel-Ritt Incorporated, Allentown, Penna.

Pests, Inc.
512 E. 14th St.
Kansas City, Mo.

June 17, 1943.

Gentlemen:

On page 22 of the current issue of Pests, I read the brief paragraph regarding Tent Caterpillars. The thought presented is good but not complete. The method suggested of burning out these webbs is very good. You must realize, however, that by merely attaching a rag to the end of a stick and soaking it with kerosene and then lighting it presents one or two serious hazards. In the first place, it will not be many seconds before the stick itself commences to burn. Then too, with the rag soaked with kerosene finding its way down the stick bringing the flame with it and probably causing a serious accident.

A much better method is to attach to the end of the stick a stout wire. After attaching the wire bend it down and then up to resemble the letter S laying on its side. Then attach the rag to the end of the wire. With the rag in contact with the wire, you eliminate first of all the natural capillary attraction which the wood presents. If any of the oil should drip, it immediately leaves the wire and cannot run down the stick. Also oil from a crank case is much more satisfactory, as it burns much slower. I have used this method in my own trees many times with perfect success. I am passing it on to you for whatever it may be worth.

Yours very truly,
D. M. Wiesen
District Manager

A Plan For Rodent Control In Cities

By G. C. SHERRARD, *Senior Surgeon (R), United States Public Health Service*

NEARLY every health officer has felt the urge, either upon his own initiative or upon the solicitation of citizens, to engage in a campaign of rat extermination. Very often such an effort follows the familiar pattern of trapping and poisoning, with publicity setting forth the destructive proclivities and disease dissemination possibilities of rodents. After a brief flurry such a campaign usually subsides quickly, with dubious or negligible accomplishments. A rat campaign based upon a misconception of the factors involved may be termed a futile public health effort.

While the important role played by rats and their ectoparasites in the transmission of disease is widely recognized by public health officials, the methods which may be utilized for the effective control of these pests on a city-wide scale appear to be less well known. If results are to be achieved in proportion to the efforts and expenditure made, careful planning of the entire program is necessary.

Designed especially for cities, the plan here outlined may readily be adjusted to existing conditions. Obviously the extent and direction of the program will depend upon size, location, and environment. Furthermore, the financial status of the city, as well as the availability of personnel and equipment, will largely influence the results.

The various administrative steps, procedures, and activities designed to promote a successful rodent control campaign in cities may be summarized as follows:

1. Trained leadership.
2. Office space and equipment.
3. Field equipment.
4. Records.
5. Survey of actual and potential harborages.
6. Trapping.
7. Identification and classification of rodents and their ectoparasites.
8. Ratproofing ordinance.
9. Cooperation with other city departments and agencies.
10. Education and publicity.
11. Enforcement of provisions of ratproofing ordinance.
12. Permanent control measures.

The logic of the measures herein described is predicated on the fact that in large centers of population rats are dependent upon man for the two absolute necessities of life, food and shelter. Of these two essentials to rat life it is most difficult and often impracticable to prevent access to food. However, measures for the removal of food beyond the reach of rats are of utmost importance in controlling the rat population.

Rat control of enduring character cannot be accomplished without the elimination of active and potential harborages. Therefore, an effective program should be based on the principle of permanent harborage elimination. All other measures are either palliative or accessory.

As a guide to those contemplating the inauguration of a rodent control program a brief description is given of various phases of such a project.

Trained leadership.—To insure the success of a plan of rodent control it is essential that the work be supervised by a thoroughly trained person. This person should have teaching and executive abilities and should be capable of assuming charge of personnel and all field activities. When trained personnel are not available, arrangements should be made to have a suitable member of the health department staff trained in a large city where effective rodent control measures are actively pursued. The United States Public Health Service may be consulted in such matters; it stands ready to give information and assistance in planning a course of instruction. A minimum period of 90 days should be allotted for the necessary training.

Office space and equipment.—Very little office space and equipment are needed in order to conduct a rodent-control program. A desk, telephone, typewriter, and a large and a small filing cabinet are essential. As the work progresses additional space and equipment can usually be acquired.

Field equipment. — Transportation is the most important item of field equipment. A light automobile with a pick-up body is ideal for the transportation of sanitary inspectors, the distribution of supplies, and the delivery of rats to the laboratory or incinerator.

Records.—The recording of data can be accomplished by the use of three separate forms designed for the following purposes:

(a) Field form.—This form should be designed to record detailed rat infestation and ratproofing data relating to the individual building and premises inspected and should be completed in the field. Provision should be made for the inclusion of all recommended corrective measures.

(b) Office form.—This form is designed for the recording of pertinent statistical data obtained from field reports and for a ready reference file.

(c) Laboratory forms.—When laboratory investigations are to be conducted in conjunction with rodent control activities, a field card similar to an ordinary shipping tag may be used for recording the time, number, district, place, and means by which such rodents were obtained.

(d) The recording of laboratory data relative to rodents and their ectoparasites should be accomplished by the use of a separate identifying serial number for each premise from which rodents are recovered. The serial number given the rodents and ectoparasites should correspond with the serial number given the premises.

Districts may be designated by letters, and subdivisions of a district by numerals. For example, District A, A1, District B, B1, etc.

Survey of actual and potential harborages.—For survey purposes a large map of the city should be obtained and districts outlined according to general types and uses of buildings, i.e., residential, retail, wholesale, manufacturing, warehouse, market, waterfront, etc. Dumps existing within the city or in close proximity thereto for the disposal of waste should be placed in a separate district. For descriptive purpose those districts embracing types of buildings, such as residential, which are widely scattered or cover a comparatively large geographical area may be further subdivided into smaller geographical units.

A number of typical buildings, including outbuildings and grounds, in each district should be inspected in order to determine existing conditions as to ratproofing and rodent infestation. The following points should be noted and recorded during this survey:

(a) Type of building — whether wood, brick, cement, stone, etc.
(b) Presence or absence of a basement.
(c) Presence or absence of rat infestation and harborages. When infestation and harborage are found, the location and extent should be noted, together with an estimation of the probable number of rodents present.
(d) Presence of potential or used rat runs.
(e) Presence and accessibility of food attractive to rats, either within the building or on the premises.

(f) Trash or rubbish which might afford harborage for rodents.
(g) Ground burrows.
(h) Method of garbage disposal, whether buried or stored in ratproof containers.
(i) General condition of the buildings as to their state of repair.

Trapping.—When a determination of the species and index of ectoparasites is desired, live rats should be trapped in each district by means of cage or small steel traps. For general trapping, however, the best results are obtained by the use of baited wooden snap traps indoors and steel traps in the open. Trapping should be done systematically by districts in order to secure representative specimens from all parts of the city. All traps should be visited daily, baiting and resetting in new locations as indicated. Trapped live rats in their cages should be delivered daily to a central laboratory for examination, classification, and recovery of ectoparasites.

Rats caught alive in steel traps may be killed on the spot and put in white cotton bags for transportation to the laboratory. Dead rats should be delivered to the laboratory when necessary to examine them for specific diseases or other purposes. All rats should be disposed of by incineration.

The recovery and classification of ectoparasites is of considerable importance from a public health standpoint, as it affords a means of determining the potential susceptibility of a municipality to rat-borne endemic and epidemic diseases.

The collection of ectoparasites.—In order to determine the prevalence and species of ectoparasites infesting live rats, it is necessary to devise a procedure which will prevent the escape and permit the recovery of all the ectoparasites infesting the rat at the time of death. Various procedures have been employed. The choice will depend on available facilities and the advisability of animal inoculation to determine the presence of endemic or epidemic disease in rats. Where animal inoculation of pooled parasites is to be done, the lethal agent should be a gas with little or no bactericidal properties. In an article published in 1939, Eskey and Haas (13) report that tests show the hydrocyanic acid gas caused only slight and variable reduction in the virulence of cultures of **P. pestis,** while chloroform in saturated atmospheres was capable of destroying the organisms. When animal inoculation is not planned, the following procedure will be found satisfactory: Upon delivery to the laboratory live rats should be killed either by crushing their necks with heavy forceps or by administration of chloroform. When chloroform is used the rats should be anesthetized in a glass or white enamel container in order that ectoparasites leaving the body during the process may be seen and recovered. In the case of rats caught in steel traps and killed at the place of capture, the bodies and containers should be brought to the laboratory where they may be subjected to a gaseous insecticide and the parasites recovered in the same manner as previously described. The inner surface of the containers should be carefully searched for parasites which may have left the body. When live rats are killed by means of forceps, the bodies should be immediately suspended by the tail over a large white enameled pan containing water. This may be accomplished by the use of heavy spring paper clips attached to a wire strung over the pan at a height which permits the rat's nose barely to clear the water. Within a period of 2 hours a large percentage of the infesting fleas will leave the cooling body and jump into the water, from which they may be easily recovered. Remaining fleas may be dislodged and recovered by combing the suspended body. Other ectoparasites, such as mites and lice, may be recovered by combing the fur over a large sheet of white paper. By stroking with a fine steel comb against the direction of the hair the ectoparasites may be seen and removed. This method must also be used to recover fleas from rats killed by chloroform. All ectoparasites should be preserved in vials containing 50 per cent alcohol for future classification. Vials should be identified with the district number and the same serial number given to the rodents from which the ectoparasites were recovered.

Identification and classification of rodents.—Rodents should be classified and identified as to species. The prevalent species for the locality can readily be identified by a laboratory attendant after a brief period of training, while the unusual specimen may be preserved for examination by a more competent authority. The sex, approximate age, pregnancy, and pathology found at post mortem should also be recorded.

Enactment of a ratproofing ordinance.—This procedure usually requires a considerable period of time and necessitates consultations by the city health officer with various members of the city council and administrative officials. Whether the ordinance is to be enacted as a part of the sanitary or building code will be determined by local circumstances. Violations of the code should be made a responsibility of the health department. Whatever the type of ratproofing ordinance enacted, it should contain the following basic provisions:

(a) Provision for the ratproof construction of all new buildings erected after the date the ordinance becomes effective.

(b) Provision for the ratproofing of existing buildings and their equipment when used commercially for the purpose of manufacturing, processing, distributing, or storing foods, food products, or wastes, either in bulk or nonratproof containers.

(c) Provision for the control of rats on public and private dumps and premises.

(d) Provision for the proper storage of garbage in ratproof containers and its disposal in such a manner as not to attract rats.

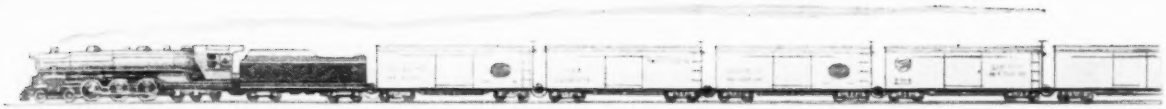
A model ratproofing ordinance is contained in Supplement 131 to the Public Health Reports, a copy of which may be secured by addressing The Surgeon General, United States Public Health Service, Bethesda, Md.

Cooperation with other city departments and agencies.—The progress of a rat control program is made much easier by close cooperation with the fire, police, building, sanitary, and other city departments or agencies which are in any way concerned with the construction, maintenance, or servicing of buildings or their contents. Representatives of these organizations are in a position to obtain and relay information concerning rat infestation. When properly informed they are capable of acting as advance agents in distributing information on the value of ratproofing.

Education and publicity.—The dissemination of information concerning the purpose, value, and methods of rat control is an important part of an effective program. The assistance which can be secured from city and civic organizations through the medium of talks and conferences will materially lighten the work of the health department in this respect. Contacts should be made with builders, contractors, and architects in order to explain the purpose and advantage of ratproofing new buildings. The cheapest and best way to ratproof a building is to include ratproof specifications in the construction plans.

Spectacular publicity campaigns are undesirable and seldom produce permanent results. The publication, in the health section of local newspapers, of interesting facts relating to rats, together with the reasons and methods for their control, is a valuable educational procedure. Pamphlets containing similar information may be prepared for distribution to schools, civic and other organizations. Patience and perseverance are the keynotes in bringing to the attention

(Continued on Page 23)



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CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY

The Alkaloids of American Hellebore and Their Toxicity to the American Cockroach

E. J. SEIFERLE,[1] I. B. JOHNS,[1] and C. H. RICHARDSON,[2] *Iowa State College, Ames, Ia.*

AMERICAN hellebore, **Veratrum viride** Aiton, a lilaceous plant indigenous to North America, possesses economic value because of the use of its roots and rhizomes as a crude drug and as the insecticide, hellebore. This use, however, has declined greatly in the last few decades, primarily because of nonuniformity of commecially available samples, the lack of an efficient method of assay, and the scarcity of information on the active components of the plant. Since the drug is characterized by several desirable pharmacologic properties useful especially in the treatment of puerperal eclampsia (Bryant 1935), and the insecticide is effective against certain insects such as the currant and gooseberry worms, **Nematus** spp., it was apparent that the plant should be further examined. The present investigation was begun with the following purposes: to examine the procedures for chemical assay of the plant, to separate the crude, physiologically active mixture into its constituents, and to test them for toxicity to insects.

The Problem of Assay.—Viehoever & Clevenger (1922) made a careful study of the methods for determining the total alkaloid content of **Veratrum viride** and of the European species, **V. album,** and showed that sodium hydroxide and ammonium hydroxide were equally satisfactory for liberating the alkaloids from the drug for extraction. In the experiments here undertaken it was noted, however, that treatment with these solutions made the drug somewhat glutinous and caused formation of emulsions during the subsequent acetic acid extractions. Substitution of a calcium hydroxide suspension as the alkalizing agent and a revision of extraction procedure overcame these difficulties. The modified assay procedure follows:

To a 10.0-g. sample of crude drug ground to 40-mesh add 150 cc. of chloroform-ether mixture (equal parts by volume), and allow to stand 10 minutes. Then add 1 g. powdered calcium hydroxide and 10 cc. water and allow to stand 1 hour with frequent agitation. Filter, and wash with chloroform-ether mixture until the washings give no precipitate with Mayer's reagent; about 50 cc. of solvent in 4 portions is sufficient. Combine filtrate and washings in a flask containing 0.5 g. powdered magnesium oxide. Shake thoroughly, filter into a separatory funnel and wash the magnesia with more solvent. Extract the filtrate with three 20-cc. portions of 10 per cent acetic acid, and then with 10-cc. portions until the last gives no precipitate with Mayer's reagent. Make the acid extract alkaline with concentrated ammonium hydroxide, and extract with three 20-cc. portions of chloroform-ether, and then with 10-cc. portions until a few drops of the alkaline solution, on acidification with acetic acid, give no precipitate with Mayer's reagent. Combine the extracts in a tared flask and evaporate off the solvent under a current of air 80° C.

In the earlier work it was observed that the second chlorform-ether extract and the residual total alkaloids after removal of solvent were more or less amber-colored and hence contained impurities. Therefore a study was made on a proprietary sample of the powdered drug to modify the above-described procedure so as to eliminate these impurities. The second organic-solvent extraction was made in part of these tests with ether first, followed by chloroform; in part with chloroform first, followed by ether; and in the balance with the solvent mixture. In those tests involving a succession of solvents the first was used until the last extract gave no alkaloid test with Mayer's reagent, and then the second solvent was used. The results of these tests, presented in tables 1 to 3, show that chloroform alone extracts as great an amount of material as does the chloroform-ether mixture, 1.58 and 1.55 per cent, respectively. The amounts of alkaloids extracted by the individual solvents, when either was used first followed by chloroform, were somewhat erratic, but the totals extracted were quite consistent, with a mean of 1.31 per cent. The residues thus obtained from the ether extractions were practically colorless. It is therefore evident that the latter procedure, which showed a mean alkaloid content of 1.31 per cent, was as effective in the **extraction of alkaloids** as the other two procedures which separated 1.55 and 1.58 per cent of the plant material. The conclusion to be drawn from this fact is that the other 0.2 to 0.3 per cent extracted by these two procedures consisted of impurities nonalkaloidal in nature.

Table 1.—Percentages of alkaloids extracted with chloroform-ether mixture in the second extraction.

Subsample No.	Percentage Alkaloids Extracted
5	1.39
7	1.53
9	1.59
10	1.71
15	1.41
16	1.62
17	1.60
18	1.56
Mean	1.55

It has been shown by several investigators that the total alkaloid content of the **Veratrum** spp. is not a measure of either the therapeutic or the toxic value of the plants and hence numerous attempts have been made to devise biological assay methods for them. The earlier bioassays depended on the lethal doses of pharmaceutical preparations of the drug for such animals as frogs (Houghton & Hamilton 1905; Pilcher 1917), white mice (Rowe 1925; Swanson & Hargreaves 1928, 1930) and guinea pigs (Githens & Vanderkleed 1910; Pittenger 1923). More recent methods have rested on physiological bases, Christensen & McLean (1936, 1939) determining the minimum emetic dose for pigeons, and Viehoever & Cohen (1939a, b) using as their criterion of effect the pigeons, and Viehoever & Cohen (1939) using as their criterion of effect the changes in swimming characteristics produced by the drug on the small, transparent crustacean, **Daphnia magna.** No assay method has yet been worked out to evaluate the activity of the plant against insects.

However, Fisher (1940) applied the modified assay procedure described above to two commercial samples of **Veratrum viride,** using chloroform-ether and also ether followed by

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Table 2.—Percentages of alkaloids extracted with ether and then chloroform in the second extraction.

Sub-sample No.	Percentage Alkaloids Extracted		
	Ether	Chloroform	Total
1	0.83	0.43	1.26
2	0.73	0.55	1.28
3	0.87	0.39	1.26
4	0.93	0.37	1.30
6	0.74	0.54	1.28
8	0.74	0.54	1.28
11	0.60	0.79	1.39
12	0.63	0.80	1.43
Mean	0.76	0.55	1.31

chloroform in the second extraction. From the first procedure he obtained "total alkaloids" and from the second "ether-soluble alkaloids" and "ether-insoluble alkaloids." These three fractions from each of the two samples he tested in baits on the American cockroach, **Periplaneta americana** (L.), and showed that the "ether-soluble alkaloid" fraction contained most, if not all, the toxic alkaloids, and that the ratio of the amount of "ether-soluble" to "total alkaloids" was similar in both samples to the ratio of the median lethal doses of these fractions. Fisher also showed that, whereas the total alkaloid contents of the two samples were nearly equal, the toxicities of the "total alkaloids" were statistically different. This corroborates against insects previous work on vetebrates which indicated that biological and chemical assays could not be directly correlated.

Table 3.—Percentages of alkaloids extracted with chloroform and then ether in the second extraction.

Sub-sample No.	Percentage Alkaloids Extracted		
	Ether	Chloroform	Total
13	1.56	0.02	1.58
14	1.57	0.02	1.59
Mean	1.56	0.02	1.58

The chemical assay method outlined above gives a more nearly accurate evaluation of the true alkaloid content of the plant than other methods that have been described. The results of these assays, however, cannot be considered a measure of the biological effectiveness of the drug. The chemical studies described below

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show that there can be a great variation in the ratio of the toxic to the nontoxic alkaloids in the plant.

Earlier Chemical Studies of the Alkaloids.—The first recorded chemical investigation of **Veratrum viride** is that by Worthington (1838), who concluded from color and precipitation tests that veratrine was present in the plant. Veratrine had previously been prepared from sabadilla seeds (**Schoenocaulon officinale** Gray) by Pelletier & Caventou (1820) in 1820. The presence of jervine in **V. viride** was first suggested by Scattergood (1862) and was later proved by crystallization of the alkaloid by Mitchell (1874). Jervine was first isolated in crystalline form from **V. album** by Simon (1837). The most important study of **V. viride,** and also the most recent, was that of Wright (1879). He isolated from the plant three alkaloids, jervine, pseudojervine and rubijervine, the latter two discovered by Wright & Luff (1879) to be components of **V. album.** Lissauer (1920) showed that none of these alkaloids was physiologically active on vetebrates. Up to the time of the present investigation these three alkaloids were the only ones that had been isolated from **V. viride.**

Subsequent work on **Veratrum album** has led to the isolation of other new alkaloids. Salzberger (1890) crystallized protoveratrine from it in 1890 and also discovered protoveratridine. Protoveratrine was shown by Eden (1892) to be physiologically active and toxic to vetebrates. In 1937-38 Poethke (1937a, 1937b, 1938a) isolated all these alkaloids from **V. album** and discovered another new one, germerine, which was shown by Haas (1938) to be toxic to vetebrates and to resemble protoveratrine qualitatively. in its physiological action. Poethke (1937b) studied the interrelationships of the alkaloids and found that germerine on partial hydrolysis yielded protoveratridine and l-methylethylglycolic acid and that protoveratridine on hydrolysis yielded the base, germine, and l-methylethylacetic acid.

In the present study the crude alkaloid mixture from **Veratrum viride** was investigated with a view to separation into its components. The material used was the crude drug as obtained from wholesale drug supply houses and was ground in a Wiley mill to pass a 20-mesh screen. During these separations many of the fractions obtained were tested for toxicity to the American cockroach, **Periplaneta americana** (L.), by the method described in the next section, the progress of concentration of the toxic constituents thus being followed biologically.

Separation of Crude Fractions.—A solution of 175 g. of tartaric acid in 5.15 kg. of water was mixed with 5.47 kg. of the ground drug. The wet drug was extracted with ether for 4 days in a continuous extractor. The resulting red-brown ether extract contained much oily material but no alkaloids. The residual crude drug was then dried in air, made alkaline with an aqueous suspension of calcium hydroxide, and extracted with ether for 6 days. During the extraction there separated on the sides of the reservoir a gray solid **A,** which weighed 47.5 g. The study of the filtrate **L** is described below.

Precipitate **A** was dissolved in 250 cc. of 10 per cent acetic acid, the solution was filtered from a slight amount of insoluble residue, and further purified by extraction with ether and chloroform. Part of this solution, **B,** was alkalized with ammonium hydroxide and the precipitated, impure alkaloids were filtered off. The balance of the alkaloids was extracted from the filtrate by chloroform and was returned to acid solution by extraction with acetic acid. The precipitated alkaloids were redissolved in 10 per cent acetic acid and refiltered, and the acid solutions were combined. To them was added a freshly prepared solution of 15 g. of metaphosphoric acid in 50 cc. of water and the flocculent precipitate **C** was filtered off. The filtrate from **C** was made faintly alkaline with ammonium hydroxide, an amorphous precipitate **D** forming which weighed 1.47 g. and was slightly toxic. The filtrate from **D** was made strongly alkaline with ammonium hydroxide, a further precipitate **E** forming which weighed 0.158 g. and was toxic. The filtrate **F** from **E** was nontoxic.

The metaphosphate precipitate **C** was suspended in dilute ammonium hydroxide to release the alkaloids from their compounds and the alkaloids were extracted with chloroform. This chloroform solution was concentrated to one-third its volume and was diluted with an equal volume of ether, whereupon 6.8 g. of a white, crystalline, precipitate **G** separated, which proved to be jervine. The chloroform-ether filtrate from **G** was extracted with two 25-cc. portions of 10 per cent acetic acid which removed part of the alkaloids. This acid solution was made alkaline with ammonium hydroxide, the resulting precipitate was filtered off and dissolved in chloroform and to the chloroform solution was added a chloroform extract from the alkaline filtrate. This combined solution was diluted with 2 volumes of ether, a crystalline precipitate **H** forming which weighed 2.24 g., was nontoxic, and was found to be pseudojervine. On further standing there separated more crystalline material **J** which weighed 3.9 g., was nontoxic, and proved to be jervine. The filtrate from **G,** partially extracted with acetic acid, was further extracted with this acid and the acid extract was alkalized with ammonium hydroxide; the resulting precipitate **K** weighed 1.0 g., was nontoxic, and proved to be jervine.

The ether filtrate from **A,** designated **L,** toxic to the American cockroach, was concentrated in a vacuum to remove the solvent, the residue was taken up in chloroform and the alkaloids were extracted with 10 per cent acetic acid. The acid extract was treated with an excess of freshly prepared metaphosphoric acid solution, and the insoluble alkaloid metaphosphate was filtered off. Since this precipitate yielded nontoxic alkaloids (see **C** above) it was worked up no further. The filtrate from the metaphosphate was made alkaline with ammonium hydroxide yielding 19.9 g. of precipitate **M,** which was toxic. In another experiment this fraction, **M',** weighed 15.9 g.

The balance of the acid solution **B** was alkalized with ammonium hydroxide and the resulting precipitate, 9.6 g., was filtered off. This was not investigated further since fractions thus obtained previously had consisted predominantly of nontoxic alkaloids. The filtrate was extracted with chloroform, the chloroform extract concentrated to 40 cc. and allowed to stand for 2 weeks. There separated out slowly 0.25 g. of crystalline material **N,** which was found to be germine.

Fractions **G, J, K.**—All these fractions were proved to be jervine, $C_{26}H_{37}O_3N$. They were purified by recrystallization either from hot aqueous methyl alcoholic acetic acid by neutralization with ammonium hydroxide or from boiling methanol by dilution with water. The recrystallized product formed needle-like crystals, m. p. 241-243° C. with decomposition,[1] after previously darkening above 200° C.: [a]23D 158.5° (ethanol, c=0.99) for anhydrous alkaloid; [a]20D 160.1° (10 per cent acetic acid, c=0.75) for anhydrous alkaloid. Poethke (1938a) reports for jervine m. p. 243-244° C. (corr.) with decomposition; [a]20D 154.5° (ethanol), 167.6° (chloroform); and Saito **et al.**

[1]All melting points were taken in a micro-melting point apparatus equipped with a microscope for observation. The temperature was raised rapidly to about 30° below the expected melting point, after which the rate of heating was lowered to about 3° per minute. The alkaloids and their derivatives with but few exceptions melt with decomposition or decompose before melting.

1936) give m. p. 243.5-244.5° C.; [a]20D 150° (ethanol).

Jervine forms a hydrochloride, m. p. 300-302° C. with decomposition, and a nitroso derivative, m. p., after 3 recrystallizations from dilute ethanol, 250-254° C. with decomposition. Poethke (1938a) gives for nitrosojervine m. p. 246-247° C. (corr.) with decomposition, and Saito **et al.** (1936) give 251-252° C. with decomposition. Jervine hydroiodide was prepared by treatment of a solution of jervine in dilute acetic acid with potassium iodide solution. The resulting amorphous precipitate was recrystallized from a large volume of methanol on addition of water. Its m. p. was 288-290° C. with much decomposition. Salzberger (1890) in an attempted preparation of jervine methiodide obtained a compound melting at 275° C. which he said was jervine hydroiodide.

Jervine picrate, which has not been previously described, was prepared from 200 mg. of jervine in dilute acetic acid by addition of excess picric acid solution. The amorphous product was dried, dissolved in the least amount of acetone necessary for solution and crystallized by addition of peroxide-free ether. The yellow, crystalline product, weighing 187 mg., darkened above 210° C. and charred without melting at 274-284° C. Analysis gave N, 8.60, 8.60; calculated for $C_{26}H_{37}O_4N$. $C_6H_3O_7N_3$: N, 8.74 percent.

Fraction H.—This fraction was recrystallized 3 times by solution in 10 per cent acetic acid, addition of methanol and neutralization with dilute ammonium hydroxide. The recrystallized product appeared in the form of colorless platelets, darkening above 280° C. and melting at 298-300° C. with decomposition. It was pseudojervine, $C_{23}H_{39}O_5N$, which melts according to Poethke (1938a) at 304-305.5° C. (corr.) with decomposition. The pure alkaloid was only slightly soluble in chloroform or absolute ethanol but was much more soluble in a mixture of the two solvents. [a]23D 133.4° (1:3 ethanol-chloroform, c=0.48); [a]18D 132.5° (1:6 ethanol-chloroform, c=0.58); [a]22D 133.1° (10 per cent acetic acid, c=0.74). Poethke (1938) gives [a]20D 139° (7:43 ethanol-chloroform).

Fraction **M.**—A 1-g. portion of this fraction was dissolved in 1 cc. of 10 percent acetic acid, diluted with water to 4 cc. and treated with a solution of potassium nitrite to separate out through their insoluble nitroso derivatives any secondary amine alkaloids, such as jervine, present in the fraction. A dark brown, sticky precipitate was formed which weighed when dry 0.65 g. The filtrate from this precipitate was made alkaline with ammonium hydroxide and extracted with ether. Evaporation of the solvent left a slightly colored residue **P** amounting to about 0.09 g. This residue was extracted with hot benzene leaving a small amount undissolved This undissolved material was washed with alcohol and then crystallized twice by solution in dilute alcoholic acetic acid and precipitation with ammonium hydroxide. Dendritic crystals were obtained which darkened above 250° C. and charred at 265-270° C. The picrate, prepared by addition of picric acid solution to a dilute acetic acid solution of the alkaloid, recrystallized to large rhombs above 220° C. and melted and boiled away at 245-252° C. with decomposition. The alkaloid appeared to be protoveratridine, $C_{31}H_{19}O_9N$, which melts according to Poethke (1937b) at 266-267° C. with decomposition; picrate, decomposing at 244-246° C. without melting completely.

(Continued on Page 28)

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Preliminary Experiments on the Silverfish *Ctenolepisma urbani* Slabaugh[1]

ARNOLD MALLIS, *Los Angeles, California*

[1]This paper is a contribution from the Entomologists for the Grounds and Buildings Department, University of California at Los Angeles.

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THE silverfish **Lepisma saccharina** L. and **Thermobia domestica** (Packard) are well known as household pests throughout the United States. A third and recently described species (Slabaugh 1940), **Ctenolepisma urbani** Slabaugh, is an important household pest in southern California. Where the infestation by this silverfish is severe, it causes some injury. It eats patches in wallpaper, removes the glaze from paper, and mars the binding of books. Valuable etchings and prints are disfigured by having the surface eaten away. **C. urbani** feeds upon textiles, especially when these are starched. As a rule, only those articles are severely damaged which have been undisturbed for some time.

Modern buildings but a few years old are often badly infested. It appears that the even temperature maintained throughout the year is favorable for the multiplication of **C. urbani;** moreover, ventilators and heat conduits, originating in the basement, facilitate the spread of the insect throughout the building for it is usually the basement area of the home that is most badly infested.

In Los Angeles pest control operators, libraries, and private individuals resort to the use of poison cards in the control of silverfish. These cars, 2¼x4 inches, are dipped in a paste consisting of 93 parts flour and 7 parts white arsenic by weight. Despite the use of these cards, silverfish and their injury are much in evidence. The following series of preliminary experiments were initiated in order to become better acquainted with the behavior of **C. urbani,** and to ultimately use this information for control purposes.

Experiment 1.—This test was conducted in order to determine whether or not the silverfish, **Ctenolepisma urbani,** feeds on the poison cards.

Ten poison cards and 10 cards coated with flour paste alone were placed at regular intervals beneath a badly infested auditorium so that one poison card was adjacent to one card with the flour paste alone.

At the end of 2 weeks the flour paste was almost completely removed from the unpoisoned cards. At the end of 6 weeks there was still no evidence of feeding on the poison cards other than on a small portion where the paste had not been spread. Apparently the insect is repelled by the poison cards.

Experiment 2.—A study was made of the preference of this silverfish for some of the bait materials used as pastes in silverfish control.

Yellow chemical paper was cut into strips 2x4¼ inches. Half of each strip was coated with a paste of one of the materials indicated below:

Beef extract, 2 grams; distilled water, 10 cc.; warmed.
Peptone, 5 grams; distilled water 20 cc.; warmed.
Gelatin (powdered), 5 grams; distilled water 20cc.; warmed.
Sugar (crystal), 5 grams; distilled water, 10 cc.
Wheat flour, 5 grams; distilled water, 10 cc.
Wheat flour, 5 grams; powdered salt, 0.2 grams; distilled water, 10 cc.
Wheat flour, 4 grams; powdered sugar, 1 gram; distilled water, 10 cc.
Salted crackers (finely ground), 5 grams; distilled water, 20 cc.
Starch, 5 grams; distilled water, 10 cc.
Glue **(LePage)**
Mucilage **(Sanford)**
Library Paste **(Sanford)**

Ten sets of these cards were then placed beneath the badly infested auditorium, and the amount of feeding was observed at weekly intervals. The temperature beneath the auditorium was fairly constant, ranging from 70° to 74° F. The amount of feeding was graded according to the following arbitrary method:

A.—Paste from two-thirds to completely removed; B.—Paste from one-third to two-thirds removed; C.—More than a few nibble marks to one-third removed; D.—A few nibble marks; E.—No feeding.

The results of this experiment are indicated in table 1.

Table 1.—Preferences of C. urbani for bait materials used as pastes based on an average of 10 cards tested for each material.

Food Ingredient	Ratings of Feedings			
	1st week	2nd week	3rd week	4th week
Beef extract	B	A	A	A
Peptone	D	B	A	A
Gelatin	D	C	B	B
Glue	C	B	A	A
Mucilage	E	E	E	E
Library paste	D	D	D	C
Sugar	C	B	B	A
Flour	B	A	A	A
Flour and salt	B	A	A	A
Flour and sugar	B	A	A	A
Salted cracker	C	B	B	A
Starch	C	B	A	A

Conclusions. — **Ctenolespisma urbani** feeds on materials of both animal and vegetable origin. Sweetman (1939) found that the silverfish **Lepisma saccharina** L. had similar feeding habits. Wheat flour, whether or not it contains sugar or salt, is extremely attractive to this silverfish; beef extract is likewise so. In descending order of perference, **C. urbani** fed upon the bait materials as follows:

Flour; flour and salt; flour and sugar; beef extract.
Ground salted crackers.
Peptone; starch.
Sugar; glue.
Gelatin; library paste.
Mucilage.

Experiment 3.—A study was made of the preferences of **Ctenolespisma urbani** for some of our more common types of paper.

Various papers, some of them furnished by a local wholesale paper firm, were cut into 2″ squares and tacked on to strips of wood. 10 sets of these papers were placed beneath the badly infested auditorium and examined at weekly intervals. The amount of feeding was graded according to the arbitrary method indicated below:

A.—Feeding upon a large part of the paper; B.—Feeding upon a small part of the paper; C.—A few nibble marks; E.—No feeding.

The results of this experiment are indicated in table 2.

Table 2.—Paper preferences of C. urbani based on the average of 10 sets for each paper tested.

Paper	Rating of Feeding 1st week	2nd week
Cleansing tissue (Kleenex)	A	A
Hamilton Bond	C	C
Kleerfect Super	C	C
Newsprint (unprinted)	E	E
Newsprint (printed)	E	E
Glazed on one side	C	C
Cellophane	A	A
Cardboard	E	E
Brown wrapping paper	E	E
Slick magazine paper	C	C
Wax	C	B
Toilet tissue	E	C
Washroom	E	C
Onion skin	A	A
Yellow chemical	C	C
Blue Bond	C	C
Coupon	E	C

The preference of the silverfish for paper may be arranged as follows:

Extremely well eaten—Cleansing tissue; Onion skin; Cellophane.

Fairly well eaten—Wax; **Hamilton Bond**; Slick magazine paper; **Kleerfect Super**; Paper glazed on one side; Yellow chemical; Blue Bond.

Poorly eaten—Toilet tissue; Washroom; Coupon.

Not eaten — Newsprint (unprinted); Newsprint (printed; Cardboard; Brown wrapping paper.

According to Lindsay (1940) who worked on the palatability of various wallpapers to **Ctenolepisma longicaudata** Esch. this silverfish fed on the various sizes which were mixed with the pigment and filler, being especially fond of such sizes as starch and dextrin. She also found that papers of pure chemical pulp were more likely to be attacked than those consisting in part of mechanical pulp. Her conclusions are borne out by this experiment, for the papers that are well eaten are all highly refined chemical pulp papers, whereas those that were not fed upon have a high mechanical pulp content. However, even the non-preferred papers may show signs of feeding if exposed for a sufficiently long time.

Experiment 4.—In this experiment the preferences of **Ctenolepisma urbani** for flour pastes mixed with various insecticides were tested.

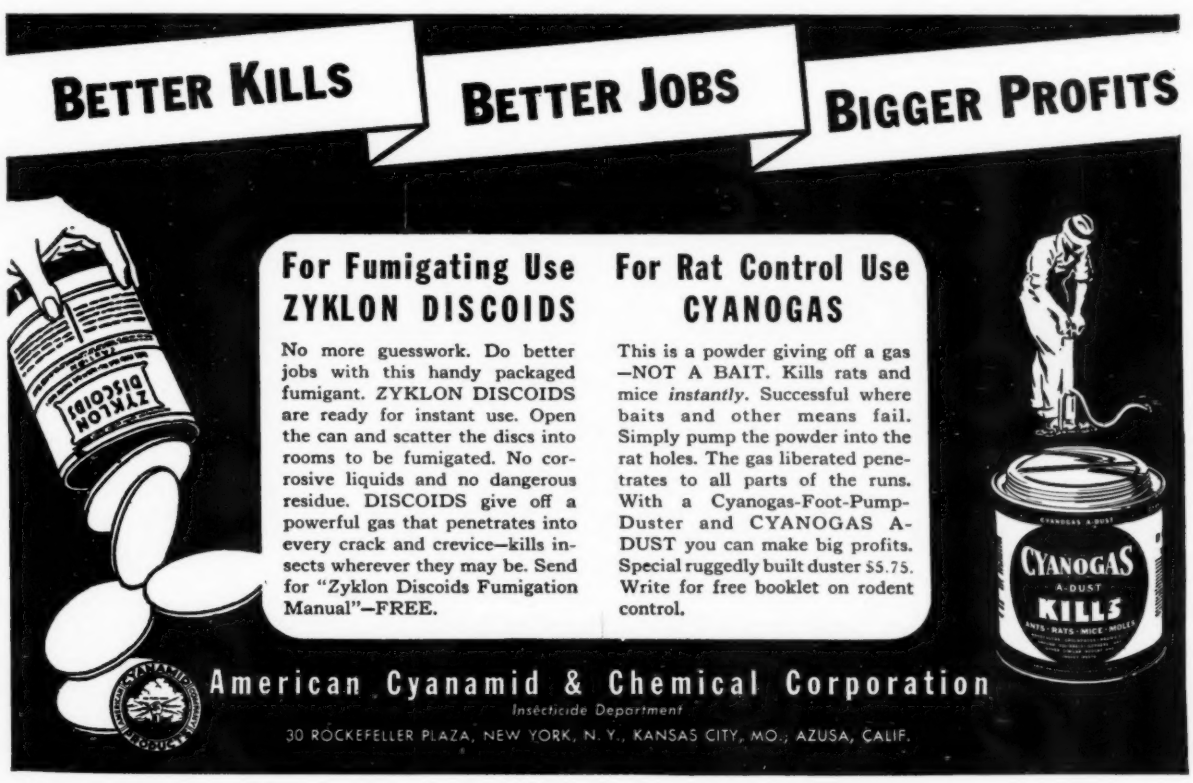
Yellow chemical paper was cut into strips 2x4¼ inches. A paste consisting of 7 grams insecticide, 93 grams white wheat flour, and 200 cc. distilled water was prepared, and the paste was applied by brush to one half each strip. These cards were then tacked to strips of wood. Ten sets were placed beneath the badly infested auditorium where they were examined at weekly intervals, and graded by the arbitrary method indicated in Experiment 2. Table 3 indicates the preference of **C. urbani** for poisoned flour pastes.

Table 3.—Preference of C. urbani for poisoned pastes based on an average of 10 sets used for each material.

Poisoned Paste[1]	Rating of Feeding 1st week	2nd week	3rd week	4th week
Sodium fluoride	D	D	D	C
Sodium fluosilicate	D	D	C	C
White arsenic	E	E	D	D
Sodium arsenite	E	E	E	E
Tartar emetic	E	E	E	E
Barium fluosilicate	C	B	B	A
Barium carbonate	C	B	B	A
Flour (check)	C	B	B	A

[1]Sodium fluoride was recommended in silverfish baits by Snipes et al. (1936), Seiferle et al. (1938); white arsenic by Wakeland et al. (1931); Barium fluosilicate by Anon. (1936); Barium carbonate by Richardson et al. (1940); Sodium fluosilicate by Reichmuth (1936).

The results indicate that, under natural conditions, **Ctenolepisma urbani** will not feed on flour pastes containing tartar emetic and sodium arsenite; it finds flour pastes mixed with white arsenic, sodium fluoride, and sodium fluosilicate, repellent; and it apparently does not detect barium fluosilicate or barium carbonate in these pastes. Richarson **et al.** (1940) found that barium fluosilicate in dry baits was repellent for the first 24 hours, but not thereafter. This experiment partially ex-**C. urbani** on cards coated with a flour paste containing white arsenic.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Experiment 5.—Tests were run to determine the mortality time for **Ctenolepisma urbani** when confined in dusts commonly recommended for the control of silverfish.

The dust under consideration was directed from a **DeVilbiss No. 36** powder blower into a 1 oz. salve jar. The bulb of the powder blower was squeezed 5 times. Twenty-five jars were prepared in the testing of each dust. One silverfish was placed in a jar, and the jars were kept at room temperature, 68 to 72° F. In the tests where the silverfish became paralyzed, it was removed from the salve jar after 15 minutes exposure to the dust, and placed in a clean, dry petri dish. The petri dish was kept at room temperature, and examined daily for mortality counts. Previous tests showed that **C. urbani** in most instances survived for 2 or more weeks though food and moisture were withheld. The results of the tests are indicated in table 4.

Table 4.—Average time for 25 individuals of C. urbani to become paralyzed or to die when confined in dusts commonly used in the control of silverfish.

DUST	Average No. Minutes To Become Paralyzed	Paralysis Distribution in Minutes	Aver- No. Days To Die	Mortality Distribution in Days
Sodium fluoride			5.0	1 to 18
Sodium fluosilicate			6.8	4 to 10
Pyrethrum[1]	5.4	3 to 10	3.0	1 to 11
Sodium fluoride and pyrethrum[2]	6.9	3 to 11	1.0	1 to 3
Sodium fluosilicate and pyrethrum	6.4	4 to 8	1.0	1 to 3

[1]All pyrethrum used in the test contained 0.75 per cent pyrethrins.
[2]All mixtures in the experiment consisted by weight of 1 part pyrethrum and 4 parts toxic salt.

When Ctenolepisma urbani is confined in dusts of sodium fluoride or sodium fluosilicate, it succumbs on an average in 5 and 6.8 days respectively. These common ingredients of silverfish poisons are therefore slowly toxic. When the insect is confined in a pyrethrum dust of 0.75 per cent pyrethrins, it shows signs of great irritation, often within 30 seconds. The pyrethrum dust adheres to the hairs on the body and around the mouthparts, as well as upon all the appendages. It becomes paralyzed, **e.g.,** incapable of locomotion, in from 3 to 10 minutes. The legs are apparently greatly affected, and soon show a lack ot coordination. In come instances the legs become detached from the body. The presence of sodium fluoride or sodium fluosilicate in the pyrethrum mixtures does not affect the time for paralysis in any notable way. When the paralyzed silverfish is placed in a clean petri dish, it eventually dies in from 1 to 11 days. Specimens not treated in any way survive for two or more weeks in a glass dish.

Experiment 6.—Tests were conducted to determine the preference of the silverfish for the more common textiles.

Circles, five-eghths inch in diameter, were punched out with a die from the following undyed materials: Linen, cotton, rayon, lisle, silk, and wool. These 6 textiles were nailed to a strip of wood. Ten such sets were then placed beneath the badly infested auditorium and examined at weekly intervals for a period of 6 weeks.

At the end of the first week indications of feeding were negligible. Thereafter feeding could be detected. The results at the end of 6 weeks showed that the vegetable fibers were fed upon, whereas the animal fibers were practically avoided. Linen was the preferred textile. Rayon, cotton, and lisle were also eaten, but not as readily as the linen. The feeding on silk and wool was negligible. When the silverfish were confined in salve jars with the above textiles, the results were indicated with those previously cited.

Under natural conditions the silverfish, **Ctenolepisma urbani** will feed on textiles of vegetable origin, such as linen, rayon, cotton and lisle. Linen is by far the preferred vegetable fiber. The feeding by **C. urbani** on fibers of animal origin, such as silk or wool is practically negligible. Damage by silverfish to textiles may be recognized by the presence of feces, scales, the irregular feeding on the individual fibers of the textile, and in certain instances, especially in the case of linens, by yellowish stains. Where damage to textiles is believed to be due to silverfish, a card coated with flour paste may be placed in the vicinity. Subsequent examination for feeding marks will reveal whether or not silverfish are present.

Experiment 7.—This test was run to determine the feasibility of trapping silverfish in rooms by means of trap jars.

A trap was prepared by binding the outside surface of a 1 oz. salve jar clear to the rim with scotch masking tape. A teaspoonful of white wheat flour was placed inside the jar. This trap was predicated on two characteristics of **C. urbani,** its attraction to flour, and its inability to climb on clean glass surfaces (or the inner surface of the jar). One hundred such jars were distributed throughout the basement laboratories of a large building where the silverfish infestation was severe. The trap jars were for the most part placed in the corners of a room where they usually were conspicious.

According to Lindsay (1940), **Ctenolepisma longicaudata** Esch. of Australia has a long life cycle, one that may extend from 7 to 8 years. Should the adults lend themselves to trapping, possibilities of control may be envisioned.

After 120 days the jars were collected; only 92 of the original 100 jars were recovered. In 18 of these jars a small species of spider had taken up its abode, and had reduced the flour and silverfish into a mass of white webbing, flour, and insect remains, which could not be counted. In each of the remaining 74 jars an average of 13.6 silverfish were trapped or a total of 1008 silverfish for the 74 jars. The great majority of these were dead. This was due in part to cannibalism, and also to the flour which apparently is slowly deleterious to them, for they succumb more quickly in a jar with flour than in a clean and empty jar. The number of silverfish trapped in an individual jar ranged from 0 to 70. Four jars in one room trapped a total of 167 silverfish.—7-23-41.

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—*Journal of Economic Entomology.*

BEDBUGS . . . . and their Practical Control

By **DR. M. H. DONER and DR. E. G. THOMSSEN,** *J. R. Watkins Co.*

Reprinted from Soap & Sanitary Chemicals.

THE bedbug and its allies represent about the half-way mark in the evolution of insects. They made their appearance about 240 million years ago in the period just preceding the rise of the dinosaurs. Since man has existed only for about 400,000 years, it is obvious that these bugs derived their food from other creatures, presumably birds and bats. Once bedbugs were free-flying insects but, owing to their adoption of the parasitic mode of life, they have long since lost their power of flight, the wings having been reduced to mere vestiges. The dinosaurs have long since become extinct but the bedbug, in common with other insects, compensated a free-living existence for a lowly parasitic existence.

That primitive man suffered from bedbug infestations, is a likely conjecture and from the study of literature it is apparent that the insect was a familiar parasite to the peoples of ancient civilizations. Brought to England more than 400 years ago, early in the reign of King Henry VIII, they were introduced into North America in the Sixteenth Century by the Spaniards. Thus the bedbug is practically cosmopolitan in habitat and has come to be so closely associated with man as to be a common household word, erroneously, however, associated with uncleanliness or poorly-kept dwellings and with institutions, jails, factories, cheap lodging houses and similar places.

The family Cimicidae, to which our common bedbug belongs, is represented in America north of Mexico by four distinct species. These can be distinguished with the aid of the following key*:

*Adapted from Riley and Johannsen.

A. Beak on underside of head short, extending to the base of the **first** pair of legs. (If not true proceed to AA).

B. Front edge of that part of body just in back of the head very deeply sinuate. . . . **Genus Cimex.** (If true proceed to C, if false, proceed to BB).

C. Body covered with short hairs; second joint of antennae ("feelers") longer than the third joint. . . . Common Bedbug **(C. lectularius.** (If not true proceed to CC).

CC. Body covered with longer hairs; second and third joints of antennae of equal length. Found on bats. . . . **C. pilosellus.**

BB. Front edge of that part of body immediately in back of head nearly straight across the middle. Found in Swallows' nests. **Oeciacus vicarius.**

AA. Beak on underside of head long, extending to the base of the hind pair of legs. Common on poultry in southwest United States and Mexico. . . . **Haematosiphon inodorus.**

The true bedbug, represented in tropical Africa and Asia by a related species **(Cimex rodundatus Sig.),** is frequently mistaken for other insects that are similar in appearance, for example, certain common, brown, flat,

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wingless insects that live in wood shavings or that feed on fermenting wood sap of freshly-cut lumber, likewise, with certain parasites of birds and bats, which, on occasion, may attack human beings.

The bedbug can be distinguished from other similar-appearing insects by the long and slender third and fourth joints of the antennae or "feelers" and by the crescent-shaped thorax which nearly encompasses the head. The body is covered with short hairs, giving the bug a rough appearance.

Occurence

The bedbug is not always associated with untidy housekeeping and unclean living quarters. In fact, the most meticulous housewife may suddenly find herself confronted with an infestation and when she does, particularly for the first time, keeps it a well-veiled secret until the insect has so established itself that control measures become urgent. This situation, due to the strong antipathy held against the insect and an attendant feeling of shame, has all too frequently given the pest a chance to become well established.

The most common avenues of entrance into dwellings are in baskets of laundry or in packages carried by travelers. Specimens have been encountered crawling on plush seats in railway coaches. They easily transfer to taxicabs or to hotels and thus become a source of further spread. Bedbugs can and do travel from house to house, particularly if the occupants of an infested house leave. Likewise, they can reach new places via walls, pipes, open windows and other similar avenues.

It is interesting to note the report of Dr. W. Herdt* that in a crowded part of the city of Malmoe, a European city of somewhat less than 100,000 individuals, 52 per cent of the houses were infested, or 28 per cent for the city as a whole. According to Haude,** surveys show that at least 65 per cent of large metropolitan areas in Europe and America are infested with bedbugs. The bedbug is claimed to be one of the most important problems in our army training camps.

Poultry houses and animal houses may become so overrun with bedbugs as to seriously impair the health of the occupants. In the U.S.D.A. Yearbook (1942) it is stated that bedbugs are "often abundant in crates, both of wood and metal, in which poultry are shipped or in which they are held and fed at markets. As many as 2,500 well-grown, well-fed bedbugs were removed from the cracks of two wooden crates taken at random from one poultry market, no count being made of the multitude of eggs and very young bedbugs present." Infested chickens "do not fatten, egg-laying is reduced, and setting hens may become weak or even die." If need be the bug can survive nearly twelve months in the complete absence of food, and observations are on record of newly-hatched bugs surviving several months without sustenance of any sort. Naturally, this ability greatly increases the potency of the bedbug as a pest of human beings.

*Soap 12(11):111-113 (1940).
**Soap 15(10):90-92, 23 (1940).

Feeding Habits

The mouth parts of bedbugs are adapted for piercing tissues and sucking. Blood is the sole article of diet and while human blood is preferred, that of canaries, rabbits, guinea pigs, white rats, mice and poultry are fed on. The false notion of many that bedbugs feed on the starch of wall paper, the juices of moistened wood or the moisture in accumulated dust is based on the observation of similar insects that inhabit such materials.

Like mosquitoes, bedbugs inject a fluid into the wound to aid in feeding and this frequently sets up an irritation that results in inflammation and welts. On the other hand, there are individuals who are entirely insensible to the "sting" and observe no ill effects. It is stated that one-quarter of all men are insensitive to the bedbug.

Feeding usually takes place at night. As soon as darkness is at hand, the insects leave their hiding places and seek their hosts. In theaters, offices and other places inhabited only during the daytime, bedbugs attack during the day. It is popularly held that bugs will drop on sleeping persons from the ceiling overhead, but this cannot be corroborated by scientific evidence.

From 3 to 5 or more minutes are required for a complete feeding. As many as nine punctures may be made before the bug proceeds to suck blood, much as a mosquito will repeatedly insert its mouthparts until a food supply is reached. After engorging with blood the insect quickly retreats and remains inactive for several days until the food is digested. As already indicated, the bedbug can exist without food for long periods of time if necessary, a feat that only intensifies the perniciousness of the insect.

Life History

The female bedbug deposits its quota of about 50 to 200 eggs in cracks or crevices that afford hiding places for the adults (cracks in furniture, behind loose wall paper and baseboards, cracks in the bed, in tufts or seams of mattresses, under the edges of carpets, behind pictures and moldings). They hatch in six to 10 days, depending upon temperature. Six to 17 days is the usual period at temperatures about 70° F.

The young bugs, somewhat transparent at first, turn brown as they get older. Before attaining adult size they must shed their skins five times and each shedding or ecdysis must be preceded by a feeding of blood. Full growth is possible in seven weeks under ideal temperature and food conditions, several times as long in winter months. In well-heated houses there may be at least four generations of bedbugs a year.

Bedbug Odor

In common with numerous other true bugs, such as the squash bug or "stink bug," the body of the bedbug is provided with pores between the hind pair of legs that emit a volatile liquid. This vile-smelling fluid serves to protect the insect from several of its natural enemies. Certain insects (house centipedes and the little red ants) do not apparently object to the odor and actually attack and destroy bedbugs. To many people this odor is most offensive and to persons who are sensitive to it this affords a convenient way of locating infestations.

Possible Disease Carrier?

Although there is no scientific evidence to prove that the bedbug in this country is a vector of human pathogens, there is every likelihood that this is possible since the bugs can be experimentally infected. Certainly, by feeding on different persons, one or more of whom may carry pathogenic organisms in the blood stream, it would seem possible that the bedbug may, upon occasion, act as a vector. At least it can be viewed with suspicion.

Control Measures

The experience of the writer has been that the finding of only a single bug in the house by a housewife is due cause for anxiety and drastic action. While it may be the only individual present, there is always the fear that others may be about or will soon be hatching. Whatever the situation may be, efforts at control should begin at once, providing, of course, that the insect turns out to be a genuine bedbug.

There are many practical methods of control that can be used, which one can use depending upon a multitude of conditions and the availability of insecticides and insecticide equipment.

Fumigation

Hydrocyanic acid gas fumigation by a licensed fumigator is indicated under conditions of heavy infestations and when the insects are out of reach of ordinary insecticides. The burning of sulfur at the rate of 2 to 5 lbs. per 1,000 cubic feet has been recommended, but does not always give successful control. The danger of tarnishing metals and bleaching certain colors often disqualifies sulfur. Haude* reported fumigation as being most commonly recommended by state experiment stations. It is not, however, a practical form of control, at least with the commonly recommended, highly dangerous fumigants and the vapors of nicotine dusts, paradichlorobenzene, naphthalene, camphor, benzene and formalin are of no value in bedbug control.

Temperature

Elevating the temperature of infested room to 120°-125° F. for several hours kills bedbugs. When it is possible to build up and maintain such temperatures, effective control can be expected. The chief difficulty encountered with this method is that pointed out by Hockenyos,** namely, the difficulty of heating up the floor of a room quickly enough to prevent escape of the bedbugs under the baseboards to a cooler level.

The filling of rooms with steam is claimed to be an effective control, but the danger in injuring furniture and other objects tends to disquality the method for use in homes.

Infested buildings that can be left open and maintained at freezing temperatures for several weeks can be eliminated of all bedbugs.

Liquid Insecticides

Much has been published as to what constitutes a satisfactory bedbug liquid insecticide. In the last analysis, it appears that what is or is not satisfactory, aside from the toxicity angle, depends in large measure upon the place where it is to be used. Thus, the use of a perfumed, refined base oil insecticides is desirable for application in hotel bedrooms, theaters, coaches and is preferred by discriminating housewives, whereas ill-smelling preparations, such as those containing nitrobenzene, are hardly acceptable. On the other hand, insecticide odor is of secondary importance and meets no particular objection in jails, cheap lodging houses and various other free, public institutions. On the farm, creosote oil or crude petroleum are very acceptable for ridding poultry houses and poultry equipment of bedbugs.

There is no question but that the use of a liquid insecticide offers the consumer a most useful, practical means of control. But if there is any doubt in the minds of entomologists as to what type of product can be expected to give complete control of eggs, nymphs and adults, we can imagine the plight of the average housewife who knows little or nothing about toxic values and the correct means of application. On the basis of Murray's*** survey, it is apparent that the average housewife buys according to brand or to what is recommended to be a "good seller." Price may be an important factor too. Superimposed on this problem is the fact, pointed out by Opitz†, that many of the ordinary household "fly sprays" are not necessarily ideal bedbug insecticides. It now appears quite clear, however, that any of the grade AA products can be expected to give good control **when properly applied.**

Although sprays of kerosene alone are toxic to bedbugs, toxicants are incorporated into the oil for greater toxicity to the eggs and adults, and for residual effect; and the lighter the base oil the greater the amount of toxicant required. Pyrethrins I and II, the toxic constituents of Pyrethrum, are ideal toxicants. They have long been used in bedbug preparations but have a comparatively short residual action. With the present restrictions on the use of pyrethrum in household sprays, other materials can be safely substituted. Calloway and Musgrave†† reported that a 3 per cent solution of B-butoxy-B'-thiocyanodiethyl ether (Lethane 384) alone or in combination with pyrethrins, was effective in destroying the eggs. Additional experimental and practical work by the Rohm & Haas Corpora-

*Soap 15(10):90-92, 123 (1939).
**Pests 8(5):12-16 (1940).
***Soap 18(10):95, 97, 99, 115 (1942).
†Soap 13(11):101, 103 (1937).
††Ann. Appl. Biol. 27:252-61 (1940); J. Hyg. 40:462-73 (1940).

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tion showed that a 4 per cent solution of Lethane 384 in a water-white petroleum distillate kills the young stages and adults and at the same time sterilizes the eggs. Two per cent solutions of Thanite, a product of the Hercules Powder Company, are also claimed to be effective for bedbugs. Sprays containing rotenone and other resins of derris or cube, either in colloidal suspension or in solution, are effective alone or in combination with pyrethrum, the aliphatic thiocyanates, and other so-called "pyrethrum substitutes."

Previous writers have stressed the essential requirements of liquid sprays for bedbugs, which are: (1), little or no residual kerosene odor; (2), properly (not too strongly) perfumed; (3), high kill of all stages; (4), freedom from staining of wall paper, mattresses, drapes, shades, carpets, etc.; 5), non-poisonous; (6), non-corrosive.

Because of the peculiar, disagreeable odor of bedbug habitats, the matter of perfuming a bedbug spray is a special problem in itself. As stated by Haude, the problem is "not merely one of masking the petroleum oil base of the spray, but also one of neutralizing the bug odor which pervades a room," which "can generally be accomplished by the use of essential oils with relatively high boiling points."

In addition to Ohio State University, several commercial laboratories, using the bedbug as a test, are developing techniques for evaluating household insecticides that are applied by atomization, but until more data is available, it seems best to postpone judgments.

Adequate directions for use are frequently wanting on labels. Most important is that the spray must be forced into all cracks and crevices. The mere filling of a room with fog, as for fly control, will do little more than activate the bugs. The liquid spray must actually contact the bodies of the bedbugs—which means that the spray must be forcefully driven into the hiding places of the insects. To accomplish this, special equipment is required. It goes without saying that the, cheap, small, hand sprayers or atomizers are inefficient. The compressed air atomizers used for cattle sprays are better and the electric sprays are ideal. Hockenyos* recommends a solid stream or fan type spray for use on cracks and crevices and a fog spray for use on bed springs and mattresses. The tendency to skimp on spray has all too frequently resulted in unsatisfactory control. Spraying should be done when the building or room is warm so that the bugs are active.

Direct Hand Application

The idea still seems to be prevalent that bedbugs can be controiled by applying liquids to cracks and crevices by means of an oil can or a feather wetted with the fliud. Presumably many a bed has been so treated and probably many a bedbug killed, but it is very doubtful if anything but partial control was obtained in most cases. Commonly recommended materials include kerosene, gasoline, alcohol, a saturated solution of corrosive sublimate in alcohol and boiling water. On the other hand, as in army barracks, where official action in controlling infestation is often delayed, hand treatment of beds is advisable. It is recommended that the bed be prevented from touching the walls, the legs placed in shallow dishes of kerosene and the bed itself either thoroughly sprayed or all the cracks treated by hand applications. The filling of cracks in infested rooms with various materials (pastes made from derris resin and petrolatum, ** ox gall-formaldehyde mixture) *** can hardly be considered a practical form of control, although pest control operators have employed such methods in treating stubborn infestations that would not yield to customary treatments. For the average home, it is better to remove all loosened wall paper or repaper. It is also advisable to fill all cracks in the walls and floor, window casings, moldings, etc., with putty or a proprietary crack filler and follow with a coat of paint or varnish. The application of a heavy coat of kalsomine to all cracks is claimed to have given relief in badly infested buildings.

The use of powders likewise cannot be considered a practical measure of control because of the difficulty of getting the powder where the bugs are hiding, unless special small hand dusters are employed. Insect powder has been frequently recommended for sprinkling in the bedding to obtain relief from bedbugs.

By way of summary it may be reiterated that while serious, hard-to-get-at infestations are best controlled by fumigation by licensed operators, ordinary household infestations can be checked by persistent treatment of all hiding places of bedbugs with a liquid type of spray applied under driving pressure.

*Op. Cit.
**Pests 8(5):12-16 (1940).
***Chem. Zentr. I, 3538 (1940).

An Amphipod Household Pest in California

ARNOLD MALLIS, *University of California, Los Angeles*

A number of householders from various parts of Los Angeles County have been startled by the appearance of small red shrimp-like animals in their homes. These are always dead, and thus are a nuisance merely because of their presence. This amphipod is related to the beach flea, and was classified by C. R. Shoemaker of the Smithsonian Institution as **Talitru sylvaticus** Haswell. According to Dr. Shoemaker, "This species was first taken in California in 1918 and has been taken there several times since. It is probable it has been observed on many occasions which have not been recorded. The species was first described from New South Wales and afterward reported from several of the Pacific Islands, including Hawaii, and in 1918 it was first observed in California, which constituted the first record for the Western Hemisphere. It has since been taken also in Louisiana."

The late W. F. Smith first brought these amphipods to the attention of the writer in 1938. They had entered a house in Wilmar, California, during a rainy period, and were apparently coming from some piles of leaves in the yard. In 1940 D. Hall, a pest control operator, found them sufficiently plentiful in the attic of a house in Hollywood so as to be swept up in handfuls. They were collected about a week after a rain. This pest control operator reported them again, in 1941, from leaves under the shrubbery of another home in Hollywood.

During the month of January, 1941, an infestation of **Talitrus sylvaticus** Haswell occurred in a home in West Los Angeles. Their conspicious red bodies were found in great numbers in the basement and garage . The amphipods entered the basement through windows screened with ⅜" mesh. Further investigation showed them to be present under ivy used as a lawn covering. Naturally, the soil beneath the ivy was moist. The living amphipods were brownish-black in color, and covered with a moist film. They jumped about like fleas, and were captured only with great difficulty. The amphipods were present in the soil to a depth of a half inch.

Since then three other infestations have come to the attention of the writer, one on the campus of the University of California at Los Angeles, another in Santa Monica, and the last in San Gabriel. In the latter locality, a part of the ground was covered with ivy, and it was beneath this ivy that the living amphipods were found.

It is very likely that rain and excess moisture forces these animals to seek a somewhat drier situation. They then invade the house by jumping through windows, or crawling over thresholds, and here they die because of insufficient moisture, their dark-brown bodies turning shrimp red. Ivy, as a ground cover, and leaf mold beneath shrubbery, apparently offer a suitable habitat for these moisture-loving animals. The entry of this amphipod into the home is a rare occurrence, and on no occasion has it been necessary to resort to control methods after the initial complaint.

—*Journal of Economic Entomology.*

Rats Wreck Car

Vancouver, Wash.—Pack rats, in a roundabout way, damaged Ed Van Derven's automobile. They buried food under his earth-floor garage, tunneling beneath a woodpile. The tunnel collapsed and the garage fell on the car.

—*N. Y. World-Telegram.*

Flame Thrower Used for First Time in Rat Control and Plague Prevention

DESCRIPTIVE details of the satisfactory use of the flame thrower, or fire torch, one of war's own tools, in rat destruction and plague prevention, in Peru, appear in an article in June "Hygeia", titled "The Fire Torch in Plague Control," by S. R. Winters, excerpts from which adjoin.

When, reports Mr. Winters, because of conditions endemic to large areas of Peru, anti-plague workers found rat proofing and vaccination were more or less impractical and various other means of rat destruction lacking in efficiency, they clamored for a method that would kill both rats and fleas that would be effective both indoors and out.

To meet this insistent need, two representatives of the Pan American Sanitary Bureau, Dr. Anthony Donovan and Senior Sanitary Engineer E. D. Hopkins, working in cooperation with the Department of Health in Peru, suggested employment of the flame thrower, subsequent use of which in anti-plague work in Peru, states Mr. Winters, is believed to be an unprecedented application of this apparatus in the control of human, insect-transmitted disease.

Dr. Donovan and Senior Sanitary Engineer Hopkins thought at first to use the flame thrower only to burn off the vegetation from ditch banks in order to expose the rat burrows lining the banks for treatment with cyanogas. This was found to be only the beginning of the usefulness of the fire torch. Wider applications are being developed, and experimental work has been carried out to determine the full value of this dreaded war instrument as a plague preventative. Some of the applications found to be satisfactory so far are: the burning of vegetation from ditch banks; the killing of rats and fleas in burrows; the burning of abandoned rat nets with possible infected fleas in mud walls, stone fences and adobe walls; the killing of fleas within infected houses; the killing of rats, fleas and other vermin in routine sanitation work in dwellings, warehouses and restaurants; the killing of rats in sewers; the igniting of brush fences (another favorite rat harborage in Peru); and the igniting of garbage and rubbish piles.

The National Anti-Plague Service continues Mr. Winters, has tried two types of torch. One consists of a four gallon tank connected with the burner coil by a flexible rubber hose, and the other consists of a one and a half gallon tank directly connected with the coil. The first type appears to be the more satisfactory. The fuel used is kerosene. The apparatus is economical to use; in continuous operation it consumes about one gallon of kerosene an hour. According to the manufacturers, the flame produced has a temperature of 2,000 F.

Before the flame thrower was used in actual field work several experiments were conducted to determine whether temperatures sufficiently high to kill rodents and rodent fleas could be quickly reached in rat burrows. An artificial burrow was used, and a temperature of 392 F. was reached in one minute, the temperature being taken in the burrow at a point 10 feet from the flame. Since a temperature of 125 F., even if lasting for only a few seconds, is sufficient to kill practically any form of insect life in any stage of development from egg to adult, it was concluded that the method is valuable in antiplague work, especially in killing possibly infected fleas in rat burrows and nests.

The flame thrower is also effective in killing the rats themselves, according to the article. The lethal effects of the apparatus do not seem to depend entirely on the high temperature produced, for rats were killed in artificial burrows when the flame was applied for only a few seconds and the temperature at the point in the burrow where the animals were caged did not rise more than a few degrees. Autopsies were performed on these rats, and findings showed that they were killed by carbon monoxide poisoning or oxygen deprivation or a combination of the two, rather than by the effects of heat.

In spite of the high inflammability of the buildings in which it is used, states the article, the flame thrower

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W. O. Buettner Discusses "Insecticide Supplies From the Service Industry Viewoint" Before War Problems Conference of the N.A.I.D.M., Hotel Statler, Cleveland, O., June 7, 8, 1943

The sessions of the twenty-ninth mid-year meeting of the N. A. I. D. M. or War Problems Conference as it was officially designated, were devoted, of course, in large measure to problems stemming from the war economy. An excellent attendance, stimulating speakers, a participating audience and a program of first essentials—all made for a satisfying and a most successful conference. Present and on the dais, among others, were several representatives of government departments.

Talks of possible kindred interest for the PCO include:

"Insecticide Supplies from the Service Industry Viewpoint"—W. O. Buettner, Secretary, N.P.C.A.

"Insecticide Needs and Supplies"—P. H. Groggins, Chief, Chemicals Division, U.S. D.A., Washington, D. C.

"Sanitation in a Large War Plant"—H. Dudley Hanson, Safety Director, Cleveland Graphite Bronze Company.

"The Washington Set-Up"—John D. Connor, N.A.I.D.M., Washington Representative.

"Problems of War Production Board"—Melvin Goldberg, Insecticides and Fungicides Unit, W.P.B., Washington, D. C.

"Business in a War Economy"—Dr. Russell Weisman, Professor of Economy, Western Reserve University, and Chief Editorial Writer "Cleveland Plain Dealer."

SYMPOSIUM—INSECTICIDES PROBLEMS

1. Pyrethrum Analysis and Official Test Insecticide—Discussion Leader, Dr. A. E. Badertscher, McCormick & Co.
2. Government Specifications—Insecticides—Discussion Leader, Friar Thompson, Hercules Powder Co.
3. Rotenone and Pyrethrum Situation—Discussion Leader, Harold Noble, S. B. Penick & Co.
4. What of Insecticides After the War?—Discussion Leader, John Powell, John Powell & Co.
5. Sprayer Situation.

PCO's guests of the N.A.I.D.M. at the conference were: F. E. Bohman, President N.P.C.A.; Lawrence A. McKenna, Regional Vice-President N.P.C.A.; Thos. C. Raley, Past President N.P.C.A.; William McCain, Director N.P.C.A.; Herman Militzer and William O. Buettner, Secretary N.P.C.A.

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is surprisingly flexible in its use in dwellings. Bearing in mind the fact that one of the industrial applications of the apparatus is burning paint from wood, Dr. Donovan and Mr. Hopkins had no difficulty using the torch in wooden or bamboo buildings or in those made of "quincha," an interlacing of cane with mud filling. They found that when the flame was passed slowly but steadily over wood, bamboo, cane and similar materials, spiders, bedbugs, fleas, cockroaches, lice, lizards and any other living thing on the surfaces or in the cracks and crevices of the walls and floors were almost instantly killed, without any detectable damage to the structures.

Dr. Donovan and Mr. Hopkins are, according to Mr. Winters, confident that their flame thrower will prove to be useful not only in the control of bubonic plague but also in combating other infections transmitted by insects and rodents especially when the transmitting agents pass at least a part of their lives in crevices in the walls and floors of human habitations or in the nests or burrows of animals, where the flame thrower can be used effectively in making a direct attack.

Study of the Winters' report raises two questions: (1) Should the fire-torch technique of control be adopted by the pest control industry? (2) If so, where and under what circumstances should it or should it not be used? Well-informed Industry opinion agrees that experimentation with it on a selective scale is in order, especially in city rodent-control projects in connection with city dumps and other rat-harboring places. However, it is felt, to attempt wholesale use of it in homes, industrial structures, cellars, and the like, might, in view of potential fire hazards and probable insurance company objections, cause the operator to wish he had never tried it. Moreover, it must not be forgotten that the factors which made institution of the flame thrower not only advisable but practicable in Peru, might, for the most part, not obtain in the U. S., particularly in those regions or areas generally serviced by the P. C. O., in short: though specialized experimentation is advised,—extreme caution is, too.

Of the 625,000 known species of insects, only about 20,000, or 32 in 1,000, spread disease or damage crops and other property. Of the 80,000 United States species, only 600, or less than 8 in 1,000, are destructive pests.

Readers, Attention!

The Post Office Department has asked that the postal delivery zone appear on mail addressed to this office. Please bear this is mind in writing us and use our zone number 6 following Kansas City 6, Mo. thus—Kansas City 6, Mo. This will facilitate more prompt delivery after the mail reaches Kansas City 6, Mo., and will be mututally advantageous.

New Chemical Mixture Kills Cattle Lice

A new chemical combination made up of two parts sodium fluosilicate, one part phenothiazine, and one part white flour, has been used successfully to destroy both chewing and sucking lice that infest cattle. In the experiments conducted at the North Dakota Agricultural Experiment Station, Fargo, phenothiazine alone, merely diluted with equal parts of flour, in trials on 12 infested animals located in various parts of the state, resulted in a 100% kill of both short-nosed and long-nosed sucking lice in every trial. However, it failed to kill chewing lice. When the sodium fluosilicate was added to the diluted phenothiazine, the mixture killed both chewing and sucking lice.

—New England Homestead

Watch Out for Pilot Lights!

The lower explosive or flammable limits of mixtures of hydrocyanic acid vapor and air have been placed variously at 5.6% to 12.8% volume concentration of the HCN, while ordinary fumigation concentrations vary from ¼ of 1% to 1 volume percent and the strongest dosage ever required for any fumigation would, therefore, be very far below the explosive limits.

However, the PCO should be especially careful to make sure that all pilot lights under hot water heaters and the like are extinguished before he applies the Discoids because there is always the possibility of a higher concentration momentarily pocketing in the immediate vicinity of the open flame with the chance of causing ignition and a fire.

—*Discoid News Bulletin.*

England Has a Mutiny on the Rat-tail Bounty:

LONDON.—When the Rural Council of the country town of Caistor agreed last year to pay two pence for the tail of each rat killed there it cut off more than it could handle.

To date 61,865 tails have been handed over the counter to the local health office—3,630 last month alone—and more than £500 has been paid out. Life to the harassed officials has been a constant stream of small boys and old men coming in with rats' tails demanding their coppers—and the postman even dump some in parcels.

The local councilors, deciding that the role of a pied piper ill suits a busy health department, will act as rat tail receivers themselves, pay out of their own pockets and claim a refund later.

Mouse Gets Into Hair of Flyer Over France

LONDON (CP).—Mice have a habit of finding their way into unusual places, but when a mouse gets into a man's hair thousands of feet over France, well. . . .

Pilot Officer Howard MacDonald, of Sidney Mines, N. S., a Royal Canadian Air Force fighter pilot, is author of this tall but true tale. During an R. C. A. F. sweep he felt something scratching his head. When he squirmed and shook his head, the scratching turned to bites. Puzzled, he clapped his hand over his helmet and discovered a mouse inside.

The mouse wasn't use to the high altitude, and at 18,000 feet the scratching and biting stopped—the rodent died for lack of oxygen.

Additional Patents Relating to Pest Control

By DR. R. C. ROARK.

2,315,581 ,Apr. 6, 1943; appl. Sept. 18, 1940). POWDER SPRAYER. Henry J. Berenson, St. Paul, Minn.—Mueller Can & Tube Co., St. Paul, Minn.

2,315,697 (Apr. 6, 1943; appl. Feb. 28, 1940). DEODORIZING DEVICE. Nicholas A. Glaskowsky, Westfield, Mass.—Stanley Home Products, Inc., Westfield, Mass.—This device is attached to an electric light bulb, the heat from which vaporizes paradichlorobenzene.

2,315,772 (Apr. 6, 1943; appl. May 23, 1941). MEANS FOR EXTERMINATING INSECTS. Carl H. Closs, Denver, Colo.—Roach poison is placed on the nap of an adhesive tape.

2,315,965 (Apr. 6, 1943; appl. Jan. 1, 1942). INSECTICIDE AND METHOD OF USING. William A. Knapp, New York, N. Y. —General Chemical Company, New York, N. Y.—An insecticide comprises as an active insecticidal ingredient a dihydroanthracene. This is effective against eggs and larvae of the codling moth.

2,316,888 (Apr. 20, 1943; appl. Oct. 8, 1941). TRAP AND BAIT BOX THEREFOR. Frederick Schreyer, Jamaica, N. Y. —Forty-nine per cent to William Bicknese, Jamaica Beach, Jamaica, N. Y.

2,315,989 (Apr. 6, 1943; appl. Aug. 7, 1940). TERMITE SHIELD. Alfred A. Tennison, Texarkanna, Ark., and James D. Tennison, Memphis, Tenn.

2,316,736 (Apr. 13, 1943; appl. Nov. 20, 1940). PROCESS FOR PRODUCTION OF CARBON TETRACHLORIDE. Joy E. Beanblossom and Walton B. Scott, Niagara Falls, N. Y.—Hooker Electrochemical Company, Niagara Falls, N. Y.

2,316,737 (Apr. 13, 1943; appl Oct. 9, 1942). PROCESS FOR PRODUCTION OF CARBON TETRACHLORIDE. Joy E. Beanblossom and Walton B. Scott, Niagara Falls, N. Y.—Hooker Electrochemical Company, Niagara Falls, N. Y.

2,316,908 (Apr. 20, 1943; appl. Aug. 19, 1939. In Germany Aug. 27, 1938). PHOSPHORIC ACID DERIVATIVES OF BACTERICIDAL COMPOUNDS AND MANUFACTURE THEREOF. Kurt Warnat, Basel, Switzerland—Hoffmann-La Roche, Inc., Nutley, N. J.

2,317,765 (Apr. 27, 1943; appl. Aug. 20, 1941). FUNGICIDAL COMPOSITION. William F. Hester, Drexel Hill, Pa.—Rohm & Haas Company, Philadelphia, Pa.—A fungicidal composition has as an active ingredient the disodium cupric or ferric salt of ethylene bisdithiocarbamic acid.

2,316,932 (Apr. 20, 1943; appl. Sept. 14, 1942). DUSTER FOR INSECTICIDES. Wesley Gordon Bruce, Dallas, Tex.—Free use of the People in the Territory of the United States.

2,317,066 (Apr. 20, 1943; appl Oct. 17, 1940). SPRAYING MACHINE. John O. Kahl, Philadelphia, Pa.—Acme Gear Machine Company, Philadelphia, Pa.

2,317,908 (Apr. 27, 1943; appl. March 14, 1941). DEODORANT. Roy I. Grady, Wooster, Ohio—A deodorant composition comprises 5 to 90 parts by weight of natural marl and 1 part by weight of lime.

2,312,368 (Mar. 2, 1943; appl. Mar. 16, 1939.) **Method and Apparatus for Destroying Insect Life in Flour and the Like in Bulk.** Franklin S. Smith, New Haven, Conn. —This electrical apparatus destroys insects and their eggs in flour that is in continuous flow.

2,312,801 (Mar. 2, 1943; appl. June 28, 1940). **Insecticide.** W. E. Craig, Philadelphia, and William F. Hester, Drexel Hill, Pa.—Rohm & Haas Company, Philadelphia, Pa.—The patentees claim an insecticidal composition in which the active principle is a methallyl ether of nitro-substituted phenols of the benzene and naphthalene series. An example is p-ter. butyl-o-nitrophenyl methallyl ether.

2,314,931 (Mar. 30, 1943; appl. Oct. 13, 1942). **Flytrap.** Richard Floyd, Mount Vernon, Ind.

2,315,345 (Mar. 30, 1943; appl. Dec. 5, 1939). **Box Trap for Catching Many Animals at One Setting.** Herman Mieth, Louisville, Ky.

2 SPECIAL CONCENTRATES FOR TERMITE CONTROL

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Write us for information concerning our SPECIAL POWDER which may be used in combination with SODIUM FLUORIDE as a contact insecticide.

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80 JOHN STREET **NEW YORK**

2,314,362 (Mar. 23, 1943; appl. Feb. 23, 1942). **Termite Control.** Lindley E. Mills, Midland, Mich.—The Dow Chemical Company, Midland, Mich.—A method for protecting wood against attack by termites comprises pressure impregnating the wood with hexachloro-cyclohexadiene-1,4-one-3 as an active toxicant dissolved in an organic solvent.

2,315,120 (Mar. 30, 1943; appl. April 13, 1939). **Spraying Device.** John H. Homrighous, Oak Park, Ill.

2,312,923 (Mar. 2, 1943; appl. Dec. 20, 1940. In Switzerland Dec. 11, 1939). **Mothproofing Composition.** Henry Martin, Basel, Hans Zaeslin, Riehen, near Basel, and Curt Glatthaar and Alfred Staub, Basel, Switzerland—J. R. Geigy A. G., Basel Switzerland—A moth-proofing composition contains as its essential active ingredient a quaternary cyclic monoamidine of the benzene series.

2,313,190 (Mar. 9, 1943; appl. June 18, 1938. In Luxemburg Dec. 17, 1937). **Process for the Preparation and Use of Anti-Cryptogamic Colloidal Solutions, Bactericides, and Insecticides.** Paul Bary, Paris, France.—A process for the preparation of colloidal solutions employable for agricultural purposes consists in feeding two solutions of compositions providing a colloidal suspension upon mutual reaction thereof (e.g., copper sulphate and sodium carbonate) to separate spraying nozzles, and bringing together said solutions at the free ends of the separate nozzles.

2,313,556 (Mar. 9, 1943; appl. June 23, 1941). **Poison Powder Distributor.** Louis E. Keopsel and Willie G. Koehler, McQuenney, Tex.

2,313,976 (Mar. 16, 1943; appl. Jan. 18, 1941). **Apparatus for Dispersing Insecticides.** William N. Sullivan, Washington, D. C., and Lyle D. Goodhue, Berwyn, Md.—Claude R. Wickard, as Secretary of Agriculture of the United States of America, and to his successors in office—This invention employs a new type of dispersing apparatus consisting of a specially constructed revolving cup which breaks up and distributes a solution of non-volatile insecticide over the inside surface of a heated cylinder where further dispersion is accomplished by instantaneous vaporization of the minute droplets. These minute exploisons produce a suspension of the insecticide which is carried into the place to be fumigated by a blast of air. The dispersed material resembles smoke or condensed vapor in appearance and it belongs to the general class of colloids known as aerosols. In a practical use of this device there was employed 5 cc. of safrole solution, containing 0.1 g. of rotenone and 5 cc. of safrole containing 0.1 g. of pyrethrum oleoresin, and dispersed it in a 200 cu. ft. chamber, in which 50 mushroom flies were liberated. All flies were dead after 24 hours. More practical tests have been run in an 18,000 cu. ft. mushroom house, which was infested with 2 species of mushroom flies. A control of over 90 per cent was obtained. Many other tests have been made with non-volatile materials or materials of very low volatility. A high initial concentration of the insecticide can be obtained, and in every case unusually high mortalities were obtained with such insects as the housefly, the cockroach, moths and beetles.

2,313,988 (Mar. 16, 1943; appl. April 30, 1941). **Amine Solts of Phenols.** Edgar C. Britton and Gerald H. Coleman, Midland, Mich.—The Dow Chemical Company, Midland, Mich.—A parasiticidal composition comprises as a toxic ingredient an N.N'.N"-tri-(cycloalkyl)-di-(amino-alkyl)-amine salt of a dinitro-phenol containing a total of 2 nitro groups, one attached in a para position and the other in one of the positions ortho to the phenolic hydroxyl group.

2,314,256 (Mar. 16, 1943; appl. May 5, 1941). **Method of and Apparatus for Cleaning and Dehydrating Oily Wood Preservatives.** Joseph A. Vaughan, Atlanta, Ga.—Southern Wood Preserving Company, Atlanta, Ga.—The patentee claims that method of cleaning and dehydrating a wood preservative consisting of coal-tar creosote and the like having a specific gravity greater than one, which comprises adding water to the preservative; agitating the water and preservative mixture; heating said mixture to a temperature of aproximately 140° F. to 160° F. and separating the preservative and water by settling; and removing the cleansed preservative.

2,314,257 (Mar. 16, 1943; appl. Aug. 16, 1941). **Apparatus for and Method of Cleaning and Partially Dehydrating Oily Wood Preservatives.** Joseph A. Vaughan and Joseph C. Vinson, Atlanta, Ga.—Southern Wood Preserving Company, Atlanta, Ga.—The patentees claim the method of cleansing and simultaneously partially dehydrating oily wood preservatives composed of coal-tar creosote and the like which is characterized by discharging the preservative in the form of a finely divided spray into a body of water to form a temporary emulsion; permitting the emulsion to separate at different levels into water soluble constituents, insoluble constituents or sludge, and cleansed preservative; removing accumulating sludge and preservative; and replenishing the wash-water to maintain the desired liquid level.

Bird Pests

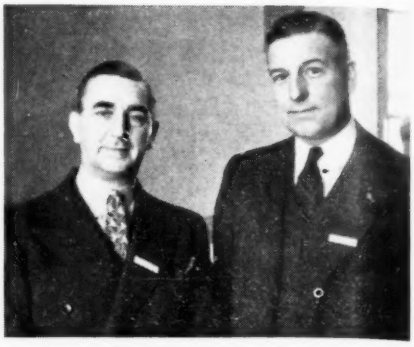
Several species of birds may be injurious to gardens. Among them the blackbirds and the crows are probably the most troublesome because of their attacks on corn immediately after planting as well as when it is in the "milk," or "dough," stage.

Devices for frightening the birds away are usually effective, particularly if they are changed frequently during the period when the garden needs protection. A frightening contrivance that is not difficult to construct consists of setting tall sticks or poles (6 to 8 feet or higher) in the ground around the garden and stringing one or two strands of twine or heavy cord between the poles. After a few days pieces of white paper may be fastened at intervals along the string, then 2 or 3 days later these could be changed to pieces of some brightly colored paper, and again to paper of a different color. Pieces of metal or mirror that reflect light from the sun or objects that made a noise in the wind may be substituted for the paper. Frightening devices are easy to install, but the birds soon become accustomed to them, hence the need to change them frequently during the few weeks that birds may be injurious to the garden.

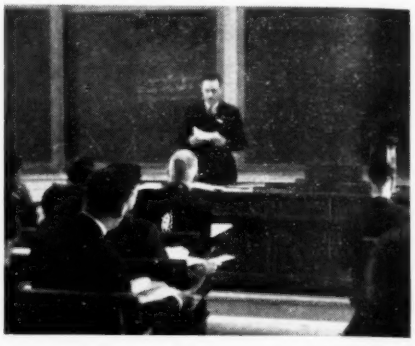
It should be borne in mind, however, that birds may be of great benefit to gardeners through their destruction of injurious insects.

—*Wildlife Leaflet 236, U. S. Dept. of the Interior Fish and Wildlife Service.*

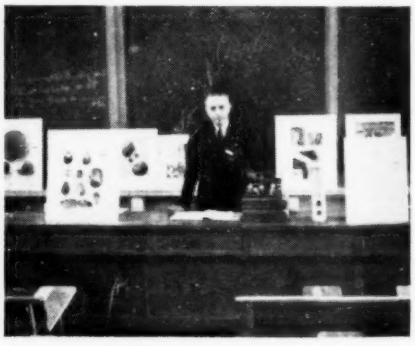
A Few Snapshots at the Recent First Canadian PCO's Conference



Left—Wm. S. Bomby, Pres. of the Canadian PCO Ass'n. Right—F. E. Bohman, Nat'l PCO Ass'n.



Dr. C. R. Twinn, Associate Entomology delivering his paper.



Charles Pomerantz at the University of Montreal.

Turkey Reports Typhus

Ankara, Turkey, (Delayed).—A serious typhus epidemic has broken out in Instanbul and approximately 100 cases were reported today in Ankara. Other population centers of Turkey were reporting cases.

Instanbul newspapers said over 300 cases were being treated there. People from the worst affected quarters were being received in public baths for fumigation. Members of the American colony so far have escaped and the American Embassy is supplying serum.

—*N. Y. Times.*

A Plan For Rodent Control In Cities

(Continued from Page 6)

of the public the need for protection against property damage and health hazards caused by rats.

School authorities should be consulted about incorporating facts concerning the history, habits, characteristics, economic and health hazards of rats in appropriate courses, such as environmental hygiene or related subjects.

Exhibits at state and county fairs provide an excellent means of disseminating information concerning rat control. By means of specimens, views, models, and drawings such exhibits impress onlookers with the economic damage inflicted and the health hazards ascribed to rats. The more common types of rat harborages and the methods used for their elimination should be demonstrated. The main theme of the exhibit might appropriately be captioned, "No rat home, no rat food: no rats."

At the 1942 Minnesota State Fair an exhibit on rat control prepared and staged by the Minnesota State Department of Health, in cooperation with the department of health of Minneapolis, was viewed with interest by 22,000 persons during a 10-day period. A moving picture film on the subject of rat control was shown to approximately 13,000 people.

Enforcement of the ratproofing code.—Every effort should be made to promote ratproofing through cooperation, education, and demonstrations. The cost of ratproofing new buildings under construction is so small that it requires no particular financial consideration. On the other hand, the cost of ratproofing old buildings may present an important economic problem, the solution of which requires good judgment coupled with justice and reason. A health department which obtains the confidence of the public and builds a favorable reputation through the wise and just administration of ratproof laws and procedures is much more likely to achieve success than would be the case were compliance too frequently made mandatory through legal action.

When it becomes necessary or advisable to test the legality of a ratproof code in the courts, the test case should be chosen with care. In the case of existing buildings the evidence of marked rat infestation should be carefully verified and the practicability of the corrective procedures plainly outlined. A store or market used for the purpose of distributing bulk foods to the public offers the best chance for a successful test.

Permanent control procedures.—Having gained, by means of the preliminary survey, information as to existing rat harborages and infestation, active permanent control measures may be inaugurated.

Conferences should then be held with owners, agents, or operators of infested buildings. The sanitary, health, fire, and trade hazards resulting from rat infestation should be pointed out and the remedies plainly indicated. Permanent control procedures, in order of importance, are as follows:

(a) Ratproofing of all new buildings during the period of construction.

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IN LANGUAGE EVERYBODY UNDERSTANDS

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Larvacide
CHLOROPICRIN

you know, is the fumigant that penetrates deep upholstery, tightly packed trunks, gets behind wall paper, etc., hitting the hard-to-reach spots where pests may find refuge from gases less potent • LARVACIDE kills the egg-life and larvae too • Write for literature on MORE EFFECTIVE and MORE PROFITABLE FUMIGATION.

Cylinders 25-180 lbs., also handy 1 lb. Dispenser Bottles, each in safety can, 6 to 12 to case. Stocked in major cities and available quickly.

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RUMETAN
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(b) Ratproofing of existing buildings and fixtures found to be infested. The consent and cooperation of owners or operators should be obtained for the ratproofing of a few especially chosen, heavily rat infested buildings for demonstration purposes. A record of the costs should be kept and care exercised that such costs are kept within reasonable bounds as related to the building and business investment. The successful outcome of these demonstrations will furnish references and publicity which will be invaluable in continuing the work and obtaining future cooperation in ratproofing procedures.

(c) Elimination of accumulated waste material. Waste material such as boxes, barrels, packing, sacks, etc., should be removed both from the buildings and premises.

(d) Storage of goods. All goods and supplies should be properly stored in a neat and orderly manner in small units and elevated from the floor. This arrangement promotes more complete visibility, prevents rats from securing an undisturbed nesting place, and makes detection easier.

(e) Trapping. This is of permanent value only in connection with ratproofing. Flat double snap traps are best for inside use and the ordinary steel traps for outside use.

(f) Fumigation. This is an emergency measure which is highly effective in securing a large and immediate reduction of the rat population in restricted areas. It should be applied in all cases where buildings or premises are infected or suspected of being infected with rat-borne disease. Following fumigation enduring rat control measures such as harborage elimination, protective ratproofing, and sanitation should be inaugurated. As fumigants which are lethal to rats are also lethal to man, the procedure should be undertaken only by experienced public health officials or licensed pest control operators.

(g) Poisoning. This method of destroying rats should be restricted to those instances where the existence of rat-borne disease necessitates the application of all possible emergency measures. The longer this procedure is applied the less effective it becomes.

Summary

Rodent control, like other important public health measures, requires foresighted planning if expectations are to be realized. The solution of the problem will be found in the continuous application of control measures rather than in evanescent campaigns. Preconceived ideas concerning results to be obtained by poisoning and trapping of rats must be discarded in favor of the slower and more difficult method of "building them out," i. e., ratproofing. At the same time food supplies must be made inaccessible, thereby serving the double purpose of depriving rodents of sustenance and conserving commodities vitally needed for human consumption.

Special emphasis has been placed on ratproofing and harborage elimination for the reason that this plan is designed for use in cities where the objective is to secure economical and enduring control of rats as a preventive measure. Where plague or typhus exists, or is suspected in either human or rodent form, more vigorous action is indicated. Under these circumstances emergency measures such as fumigation, trapping, and poisoning should be promptly undertaken and continued as long as laboratory examinations indicate the presence of infection.

The plan outlined, with modifications adapted to local requirements and conditions, has produced satisfactory results in the past and, in the hands of conscientious administrators, will continue to do so in the future.

Acknowledgments

The cooperation of Medical Directors Robert Oleson and C. L. Williams in the editing and preparation of this manuscript is gratefully acknowledged.

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For the benefit of those desiring more detailed information on this subject the following references will be found of value:

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—Public Health Reports, May 1943.

Capitol Rats Annihilate a Cat, But Lose a Battle of Strategy

Bold Invaders Damaged Revolving Door Used by President—Pincers Movement Results in Nightly Catch Being Reduced From Fifty to Five, but They Still Hunt the "Smart Ones."

Washington. — The capitol's commando rats are in full but organized retreat today after demolishing a witless cat named Willoughby and damaging the President's revolving door.

Arthur E. Cook, leader of an encircling movement against the horde of rodents that for a time threatened to take over the symbolic seat of government, claimed a virtually complete victory.

The rats, big, gravish monsters, fell victims to the old military strategy of the pincers movement, aided by science and mechanized equipment.

Long a Worry.

For Cook, supervising engineer of the capitol, the rats have been a violent headache for many a moon.

"But I think we have the problem licked at last," he sighed. "Official counts show a catch averaging about only five a day now."

Which is quite an accomplishment when you consider that only a short time ago the rats infested the capitol's labyrinthian cellars and storerooms in such numbers that a "catch" of fifty or more in one night was considered par.

These rats that moved into the capitol months ago are not of the ordinary variety. Reputedly they are a Norwegian species, big, wily and tough.

Cook declared war after they had become so bold as to chew up the revolving door through which the President passes when he addresses Congress.

The Capitol gave up when Willoughby, who never was too bright, blundered into an ambush one night and was annihilated so thoroughly that he lost all nine lives.

Locates 200 Traps.

In desperation, Cook rounded up 200 rat traps, laid in a supply of scientifically-prepared bait and appointed one of his laborers, Jim Young, chief of the anti-rat squad.

Young is scientific. Instead of setting just one trap outside a rat hole, he sets four or five in a circle and the rats apparently bounce off one into another. Very effective, says Young, whose high score for a single night is sixty-seven.

The Capitol rat situation now, Cook claims, is the "best it's ever been," but Young is still trying to corral the "smart ones," veterans of the toughest rat war in congressional history.

LOCAL ORGANIZATION NEWS

Rodent Control Projects and Industry Problems Reviewed by W. O. Buettner, Secretary of the NPCA, at Meetings in Chicago, Detroit, Cleveland, June 5, 6, 7, Respectively

On a quick trip through the midwest, early in june, W. O. Buettner spoke on three successive days before a like number of PCO groups and guests. So great was the interest manifested in what he had to say that not one of the sessions lasted less than three hours, which incidentally, were also given over in generous measure to "Questions and Answers", always a stimulating and instructive feature of any program.

Central in his talks, before the Chicago Medina Athletic Club meeting on June 5, the Hotel Shelby, Detroit, Dinner Meeting, on June 6, and the Hotel Statler, Dinner Meeting, Cleveland, June 7—all three of which were not only well attended, but attracted numerous top-ranking PCOs from neighboring states as well—was the war effort, rodent control projects and war-time dislocations, insofar as they affect the industry. An index of topics covered includes: Priorities, manpower, supply situation in general, general local items of interest such as advertising, legislation, etc.

Walter S. McCloud presided at the Chicago meeting, at which noses of several PCOs from 85-mile-away Milwaukee were counted, not overlooking the PCO who came all the way from St. Paul. George Hemmert, ably assisted by Ray V. Bechtel, was in charge at Detroit, with Larry McKenna carrying on efficiently at the Cleveland meeting, at which one of the honored visitors was A. M. W. Carter of the Gov't. of Canada Pesticides Administration, Ottawa. At the close of this meeting, the entire group attended the Rodent Control School, Cleveland, conducted by George W. Dyer of the Fish & Wildlife Service U. S. D. I.

Of added note is the fact that President Bohman made a special trip to Cleveland to attend the NAIDM meetings, as did Tom Raley, Co-Chairman of the Local (NPCA) Convention Committee, who, as a matter of fact, attended all three meetings before

Chicago PCOs Meet June 5, 1943

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which he discussed briefly the St. Louis NPCA War Time meeting to be held October 25, 26, 27. Lieutenant Harold E. Jennings (Smithereen Co.) who has undergone considerable war experience in the Pacific, was in town during the Chicago meeting, though, unfortunately, he could not attend.

Among those present at the Chicago meeting, held at the Medina Athletic Club June 5th, 1943, were:—

Maurice Bailie, South Bend Exterminating Co.
Stanley L. Lind, American Laboratories, Inc.
Irene Hunt, Monroe Laboratories, Inc.
C. Norman Dold, Rose Exterminator Co.
Samuel Grossman, A N D Exterminators.
Joseph Tilger, Sanitary Service Co.
Alfred I. Stone, Stone Chemical Laboratories, Inc.
R. J. Murray, Robertson Exterminating Co.
J. R. Franklin, Hammond Exterminating Co.
W. K. Delaplane, Jr., Illini Pest Control Co., Urbana, Ill.
Ellsworth G. Klein, Klein Exterminating Co., Milwaukee, Wisc.
Jules B. Smith, A-Veri-Best Exterminator.
Henry Turrie, Wil-Kil, Inc.
William Turrie, Wil-Kil, Inc.
Harry J. Hammond, W. P. Hammond & Son. Inc., Milwaukee, Wisc.
Mr. and Mrs. William H. Harmon, Red Star Exterminating Co.
Thomas C. Raley, Getz Exterminators, Inc., St. Louis, Mo.
Max J. Levy, Twin City Exterminating Co., St. Paul, Minn.
Harvey W. Klein, Klein Exterminating Co.
R. G. Clark, Chicago Exterminating Co.
Mr. W. H. Last, W. H. Last Pest Control Co.
Victor C. Newman, Certified Exterminating Co.
Arthur B. Tronsen, Armitage Pest Control Co.
Vernon F. Perfect, Gets-All Insect Control.
Clyde E. Renfroe, Renfroe Exterminating Service.
Ben Federman, Shur Deth Exterminating Co., Inc.
Robert E. Brawner, Thirteen Insect Co.
Earl L. Salomon, Frederick Peres & Co., Inc.
Mr. and Mrs. W. W. Windmeier, Airway Exterminating Co.
H. C. Kaufman, The Pesticide Co.
Marilyn Singer, Singer Sanitation Co.
A. Anderson, Anderson Exterminating Co.
Minnie McHugh, Nueva Fumigating Co.
Louis L. Paul, Nueva Fumating Co.
Joseph DeFiore, A"Globe Exterminating Co.
Walter S. McCloud, W. B. McCloud & Co.
William O. Buettner, Buettner Pest Control Co.

Among those present at meeting held in Detroit Sunday, June 6, 1943 were:

George Hemmert, Safe Way Exterminating Co.
Viola Russell, Better Service Fumigating Co.
M. S. Van Auken, The J. J. Carroll Co.
Arthur B. Goulet, Reliable Fumigating Co.
O. L. Potter, Down River Fumigating Co.
M. F. Goulet, West Detroit Fumigating Company.
David M. Carey, Hi-Power Fumigating Company.
Jake Seidman, Dependable Fumigating Company.
Ray Bechtel, Aristo Extermination Co.
P. E. Lynch, City Health Fumigating Co.
E. G. Grandy, Nox-All Fumigating Co.
H. S. Barsamian, Barsamian Fumigating Co.
Manuel Russell, N. S. Fumigating Co.
Thomas C. Raley, Getz Ext. Inc., St. Louis, Mo.
Wm. O. Buettner, National Pest Control Association.
Harlem B. Ives, Rose Exterminator Co.
W. J. Stover, Atlas Fumigating Co.
A. R. White, Jr., North End Pest Control Service.
M. S. Sempliner, Eradico Products Co.
Myron Sempliner, Jr., Eradico Products Company.
Ken Goulet, Cyanide Gas Co.

Among those present at the meeting held in Cleveland, Monday, June 7, 1943 were:

Lawrence A. McKenna, A. C. Exterminating & Chemical Corp.
William H. Norden, H. A. Curry Company.
W. F. Amann, W. F. Amann Company.
A. M. W. Carter, Gov't. of Canada Pesticides Administration.
George W. Dyar, Fish & Wildlife Service, U. S. D. I., City Hall, Cleveland, O.
Barbara A. Laing, Laing Exterminating Company.
James W. Johnson, Jr., City Hall, Cleveland, Ohio.
Henry Vermilye, Knox Fumigating Company.
Dr. Clyde W. Kearns, University of Illinois, Urbana, Ill.
F. E. Bohman, President National Ass'n. Birchard System, Inc.
A. M. Akers, Rose Exterminator Company, Cleveland, Ohio.
Harlem B. Ives, Rose Exterminator Company, Detroit, Michigan.
W. H. McCain, Extermital Chemicals, Davton, Ohio.
Herman C. Militzer, H. M. Laboratories, Toledo, Ohio.
George B. Lay, Fish & Wildlife Service, Boston.
Tracy Reynolds, Relnolds Extermintors Company.
Thomas C. Raley, Getz Inc., St. Louis, Missouri.
Dr. Carl J. Weinman, Illinois Natural History Survey, Urbana, Ill.
Oscar L. Potter, Down River Fumigator, Encorse, Mich.
Delphine Potter, Down River Fumigator, Encorse, Mich.
William O. Buettmer, National Pest Control Association, Inc.

Canadian Pest Control Operators Association

Congratulations are in order on the issuance of a Service Letter patterned after those of the National Pest Control Association. Service Letter No. 1 was issued on May 26. The Canadian PCO Association has listed 47 members, of which 42 are active members and 5 are allied members.

The board of directors and officers are:

President—W. S. Bomby, Ocean Chemicals, Ltd., 165 Wickstead Road, Leaside, Toronto, Ont.

Secretary—E. R. Bellemare, 2900 Mount Royal Blvd., Montreal, Que.

Treasurer—E. J. Gentle, Pest Control Service, 471½ East, King Street, Hamilton, Ont.

Directors

Wm. E. Mackie, W. E. Mackie & Sons, 609 Robie Street, Halifax, N. S.
M. A. Sanderson, Reliable Exterminators, 64 West, Wellington St., Toronto 2, Ont.
Charles Riess, Chas. Riess & Company, 372 Colony Street, Winnipeg, Man.

Vice-Presidents

Eastern Territory: (Quebec and Maritime)—A. Friedman, Superior Sanitary Service Reg'd., 1226 St. Urbain St., Montreal, Que.

Central Territory: (Ontario)—R. W. Menzie, Derpo Products, Rear 7 Awde St., Toronto, Ont.

Western Territory: (Manitoba, Saskatchewan, Alberta, British Columbia)—P. W. McLeod, Service Fumigating & Pest Control Co., 844 Kingsway, Vancouver, B. C.

With permission of Secretary E. R. Bellemare, we are privileged to reprint portions of this letter.

NATIONAL PEST CONTROL ASSOCIATION CANADIAN MEMBERSHIP. We are pleased to say that since February, a good number of Canadian Pest Control Operators have become members of the National Pest Control Association. The Pest Control Operator who fully understands what is good for him will not hesitate to belong to both associations. Read again our February 12 letter and think it over. The officials from the National Pest Control Association have shown enough their interest in us to remove any hesitancy on the advisability of becoming a member. It should be understood that with the low fee the Canadian Pest Control Operators Association is charging and its relatively small number of members, it can not be expected to carry the load of supplying information on all subjects of pest control . . . which work is being done splendidly and most efficiently by the National Pest Control Association. And now, more than ever before, everyone feels the need for guidance in making a choice of the proper substitutes to replace the wanting materials and in perfecting his method of control in order to make up for possibly less powerful control materials. Act now and do not lose one single of the National Pest Control Association's Service Letters.

MANPOWER and National Selective Service Regulations. At an informal meeting held in Toronto on May 5th and where eleven members were present (this number does not include Dr. C. R. Twinn, Associate Dominion Entomologist and Mr. A. M. W. Carter, Director of Pesticides, W. P. T. B., who were kind enough to attend our meeting and help us by their suggestions) there were discussed the steps which should be taken to have our industry declared essential with regard to the draft plan. It was suggested that a questionnaire be sent out to the industry in order to present the National Selective Service Board with a census of the men employed by the Pest Control Industry. At the time no decision had been taken by the United States Selective Service System. Things will now be much easier for us after the splendid success attained by the National Pest Control Association in having the United States pest control industry declared essential (National Pest Control Service Letter No. 292). Therefore no questionnaire as to personnel will be sent unless strictly necessary and an interview will be sought with officials of the National Selective Service Office.

LAST ITEM OF LAST LETTER TO THE INDUSTRY AT LARGE. So far we have carried the news to all the members of the industry regardless of membership in the association or of willingness to belong. We believe that the original group who attended the Ottawa meeting and

those who joined them in March have gone as far as they could and may be farther than they should be decently expected to go. We feel that enough has been done already to show that this association "means business" and that there is no reason for anyone to delay giving it his support. We repeat: one only needs to get in touch with the vice-president in his territory or with the secretary's office, secure an application blank, fill it in and return it, together with a cheque for $10.00, amount of dues for current year.

V. H. Montgomery and E. G. Mills Address Sanitarians at Berkeley, Calif.

Constant cooperation between PCOs and other professional agencies, especially Sanitarians, whose activities include structural pest control, is essential if all are to function at their most efficient best.

A welcome instance of this much-to-be-desired collaboration between PCOs and Sanitarians, two groups engaged in lines of endeavor which have much in common, is the invitation extended V. H. Montgomery* and E. G. Mills** by the Northern California Section of the National Association of Sanitarians to speak on its program at its meeting at Berkeley, Calif., held May 26, 27, 28, which invitation came about, it is believed, as a direct result of pest control conferences held at the University of California in recent years.

"Rat Control from the Pest Control Operator's Viewpoint," theme of Mr. Montgomery's talk, in which he touched on reasons why the Rat Control Operator is hired, reminded Sanitarians that layman seldom, if ever, realized or considered health measures involved.

Continuing he discussed responsibility for rat infestation and pointed out interest and responsibility of Federal, State, County and local agencies; reminded Sanitarians that the tenant cannot be effectively held responsible and that property owner is only one responsible, with most States and municipalities having laws or ordinances to this effect. A practical efficient and fair method—fair to the property owner as well as the competent PCO—by which the Sanitarian might compile a list of dependable PCOs was described by Mr. Montgomery, with the suggestion that the Sanitarian furnish this list with a copy of the ordinance to the property owner in the event that pest control on his property becomes mandatory under the law.

In closing Mr. Montgomery warned that if the Pest Control Industry cannot or does not perform the services for which it is paid, it will neither get nor deserve the respect and cooperation of the Sanitarians.

Mr. Mills discussed "Insect Pest Control from an Operator's Viewpoint," but, unfortunately, up to press-time, a resume of his remarks had not been received.

*Of Montgomery Pest Control Co.
**Of Pacific Exterminator Co. San Francisco, Calif.

R. A. F. to Help Fight North Africa Locusts

LONDON.—The Royal Air Force, the camel corps and troops will be used in North Africa in a campaign against an old enemy —the locusts which have plagued desert countries since Biblical times, the British announced today.

Reconnaissance planes will be used to spot the great swarms from the air when the locusts settle to lay eggs. Members of the camel corps will serve as lookouts. Anti-locust units assisted by troops then will attempt to destroy the newly hatched insects

SANITARY PRODUCTS And Their Manufacture, Testing and Use

This book is exactly what it is stated to be, that is: "A practical handbook dealing with disinfectants, insecticides, liquid and oil soaps, floor waxes, deodorizing blocks, soap dispensers, sprayers, etc." It is of practical interest to manufacturer, salesman, purchasing agent, superintendent, health officer, etc., inasmuch as it discusses with clarity, manufacturing phases, methods of distribution, usages and other matters pertaining to widely used products of a chemical nature usually classed under the head of sanitary supplies. Because testing, packaging and labeling are also covered, it is a veritable bible of the sanitary products industry and can be read and studied with profit by everyone associated with the industry.

Any book written as interestingly as this one will command attention and interest but once a member of the industry takes it up he will find it difficult to lay down until he has read it through.

It is stated to be the first book devoted solely to the sanitary products industry. Written by Leonard Schwarcz, it is a noteworthy contribution to a better understanding of the importance of sanitary products and their relationship to health.

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The Alkaloids of American Hellebore and Their Toxicity to the American Cockroach

(Continued from page 11)

Fraction M'.—A 1-g. portion of this fraction was dissolved in dilute hydrochloric acid, diluted to 30 cc., 3 cc. of alcohol was added, the solution was heated to boiling and several drops of 70 per cent perchloric acid were added. A brown precipitate of perchlorate weighing 0.37 g. was formed. This was suspended in dilute ammonium hydroxide and extracted with ether, the residue after removal of the ether was dissolved in dilute acetic acid, the solution was alkalized with ammonium hydroxide and extracted with ether. Evaporation of the ether left 0.29 g. of residue which was taken up in dilute acetic acid; the solution was made alkaline with ammonium hydroxide and the resulting precipitate was dissolved in alcohol and dilute acetic acid, and the alcohol was evaporated off under vacuum, whereupon much of the coloring matter separated out. The supernatant liquid was poured off(made alkaline with ammonium hydroxide and extracted with ether. Removal of the ether left a residue weighing 0.18 g. This was recrystallized twice from hot, dilute alcohol, forming about 10 mg. of needle-like crystals which melted at 239-243° C. with slight decomposition. The hydroiodide was prepared, recrystallized from acetone by dilution with ether, forming rosettes of colorless crystals; m. p. 269-273° C. with decomposition. This alkaloid was rubijervine, $C_{26}H_{43}O_2N$ Poethke (1938a) gives for rubijervine m. p. 239-240° C. with decomposition; hydroiodide, m. p. 261-262° C.

Two grams of fraction **M'** was dissolved in 1.1 hydrochloric acid and the solution was diluted to 250 cc., placed in a continuous extractor and extracted with chloroform. Nine successive portions of extract were collected which contained only small amounts of alkaloids. The acid solution was then neutralized by successive portions of ammonium hydroxide, during which time the chloroform extraction was continued. While the solution remained acidic, negligible amounts of alkaloid were extracted but extracts obtained when the solution was first slightly and then strongly alkaline contained considerably more alkaloidal material. On standing they yielded crystalline products which were identical with fraction **N.**

Fraction **N.**—This fraction, weighing 0.25 g., was recrystalized from a concentrated solution in methanol, forming large rhombs and cubes which melted partially at 170-175° C., darkened and resolidified in part above 190° C. and melted with decomposition at 215-227° C.

Poethke (1937b) observed that germine sintered between 160 and 170° C. and melted about 220° C. The product from fractions **M** and **N** was observed to be soluble in chloroform, methanol, ethanol, acetone and water, and somewhat in ether. It crystallized from methanol with varying amounts of solvent of crystallization, the loss in weight on drying varying in 13 tests from 10.06 to 12.76 per cent. Poethke found that germine crystallized from methanol lost 13.34 and 12.65 per cent of its weight on drying. [a]16D 23.1° (10 per cent acetic acid, c=1.13); [a]24D 20.0° (10 per cent acetic acid, c=1.10). Poethke gives [a]20D 21.1° (dilute acetic acid) for germine. From the observations of melting point characteristics, solubilities, solvent of crystallization and optical rotatory power, it was concluded that the product here obtained was the germine of Poethke. However, micro-analytical data did not give as close checks of the theoretical formula established by him as were desired. These results are shown in table 4 which includes the data of Poethke (1937b) and data obtained in parallel analyses of the alkaloid cevine, $C_{27}H_{43}O_8N$ also.[1] As a postive check on the accuracy of the analyses alternate samples were run on carefully purified hippuric acid.

Conclusions might be drawn from these analyses that the formula for germine, $C_{26}H_{41}O_8N$, given by

Table 4.—Microanalytical data for genuine and cevine, dried to constant weight at 110° C. over P_2O_5.

Compound	Per Cent C	Per Cent H	Per Cent N
Calculated for germine, $C_{26}H_{41}O_8N$	62.99	8.34	2.83
Found	63.53	8.78	3.16
	63.74	8.76	3.09
	63.39	8.60	3.18
	63.40	8.63	3.08
Mean	63.51	8.69	3.13
Found by Poethke	63.08	8.55	3.07
	62.96	8.52	—
Calculated for cevine, $C_{27}H_{43}O_8N$	63.61	8.51	2.75
Found	63.45	8.50	2.79
	63.55	8.68	—

Poethke is erroneous, or that the compound isolated from **Veratrum viride** in these experiments is different from Poethke's germine from **V. album,** despite their similarities in physical properties. A careful study of Poethke's paper (1937b) on germine and the related alkaloids, protoveratridine and germerine, however, showed that that author has ample support for his suggested empirical formulas for those alkaloids. Furthermore, there is considerable likelihood of the same alkaloidal unit being present in two such closely related species as **V. viride** and **V. album,** in which case the compound here isolated would be identical with Poethke's germine. There is equal likelihood of two distinct, though similar, alkaloidal units being present in these species, the physical properties of the two being indistinguishable but the chemical formulas being somewhat different. For lack of definite proof on this point it is assumed that the alkaloid here isolated is identical with Poethke's germine.

Comparison of Germine and Cevine.—The formula of germine, $C_{26}H_{41}O_8N$, is similar to that of cevine, $C_{27}H_{43}O_8N$, which is the basic hydrolysis product of cevadine and veratridine from commercial veratrine, prepared from sabadilla seeds. Poethke (1937b) first called attention to this similarity and pointed out further the agreements and disagreements in other properties of the two alkaloids, from which it is evident that the two alkaloids are very similar.

The possibility that cevine might be the methyl ether of germine lacks support for Macbeth & Robinson (1922) found no methoxyl in cevine. A further supposition of homology is possible. Should homology exist, the problem of the structure of germine, and hence of the highly toxic alkaloid, germerine, would be greatly simplified, for the structure of cevine is being elucidated by Jacobs & Craig (1937a, 1937b, 1938a, 1938b), and Craig & Jacobs (1939a, 1939b, 1940). The supposition of homology is partially discounted by the fact that cevine on treatment with alcoholic potassium hydroxide forms crystalline potassium cevine while germine on similar treatment forms no precipitate. It was felt that further comparisons might be made between the chemical reactivities of cevine and germine in order to shed light on the possible relationship between these alkaloids. To this end hydrogenation experiments were carried out on the two alkaloids.

The hydrogenation experiments were made on 16- to 51-mg. samples in an apparatus devised for the purpose (Johns & Seiferle 1941). The catalysts were Raney's nickel and the platinum oxide of Adams & Shriner.

Cevine was hydrogenated in methanol and in glacial acetic acid solu-

[1]The sample of cevine on which these experiments were made was very kindly supplied by Dr. L. C. Craig of the Rockefeller Institute for Medical Research.

tion with the platinum oxide catalyst, two atoms of hydrogen being absobed in 24 hours. The product was isolated and recrystallized from a concentrated solution in methanol. The resulting crystals melted in part between 173 and 185° C., crystallized in part between 195 and 205°, started to decompose and effervesce at 223°, crystallized in part again and finally melted at 260-262° C.; [a]25D—17.0°, —14.1° (methanol, c=2.34, 2.27). Analysis; C, 63.10; H, 8.94; calculated for $C_{27}H_{45}O_3N$: C, 63.36; H, 8.87 per cent. Jacobs & Craig (1938b) had been unable to hydrogenate cevine with the platinum oxide catalyst but they did succeed in obtaining the absorption of one mole of hydrogen with Raney nickel. They isolated the product, $C_{27}H_{45}O_3N$, which softened with effervescence at 220° C. due to loss of solvent, but resolidified and then melted at 263-265° C.; [a]25D—8° (methanol).

Numerous attempts were made to hydrogenate the germine obtained above, all without success. The trials were made with Raney's nickel catalyst in methanol and with the platinum oxide catalyst in ethanol and in glacial acetic acid. It thus appeared that cevine and germine are distinctly different in their reactivities toward hydrogenation.

Discussion of the Chemical Studies. —The experimental work here undertaken showed that the predominant alkaloids of **Veratrum viride** were jervine and pseudojervine. Jervine was obtained as about 17 per cent and pseudojervine as about 3.3 per cent of the total crude alkaloid fraction. Rubijervine was also obtained but in extremely small quantities. These alkaloids had been shown by Lissauer (1920) to be nontoxic to vertebrates. In addition, protoveratridine and germine were here isolated from **V. viride** for the first time. The former was obtained in quite small amounts and the latter was crystallized in amounts equivalent to about 1 per cent of the total alkaloids. Both of these alkaloids had been shown by Poethke (1937b) to be hydrolysis products of the toxic alkaloid, germerine.

Although no germerine or protoveratrine, toxic and predominant alkaloids of **Veratrum album,** were obtained in these experiments the presence in **V. viride** of some toxic alkaloid such as these is definitely indicated, especially by the separation of highly toxic crude alkaloid fractions. This toxicity might have been due originally to germerine or protoveratrine or both and these alkaloids, since they are rather unstable to hydrolytic agents, may have been eventually partly degraded even by the mild treatments employed in these investigations. In the case of proveratrine this would be a quite plausible explanation, for this alkaloid is readily hydrolized and Poethke was unable to crystallize its basic hydrolysis product. However, were germerine aiso present in considerable amount the inability to crystallize it or its partial hydrolysis product, protoveratridine, in appreciable amounts is not understood.

A somewhat similar experience was reported by Poethke (1938b) in his examination of the amorphous alkaloid fraction from **V. album.** From this fraction, which amounted to 50 per cent of the total alkaloids, he was unable to isolate a crystalline product, but on hydrolysis he obtained 40 per cent of germine. That this germine had come from hydrolysis of germerine or protoveratridine Poethke held to be highly improbable because of the relatively ready crystallizability of these two alkaloids.

Toxicological Experiments. — The toxic properties of many fractions separated during this investigation, including those from which proto-

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veratridine and germine were obtained, as well as some of the pure alkaloids isolated, were tested by microinjection of their solutions into the American cockroach, **Periplaneta americana (L.).** In this way the progress of the fractionation procedures and the concentration of the toxic components by these procedures were followed biologically.

Method.—The method of injecting solutions into the American cockroach used in these experiments was somewhat modified from that described by Campbell (1932) and modified by Yeager **et al.** (1932). The injection needle, its tip beveled on a fine carborundum stone to facilitate penetration of the insect cuticula, was attached with a short piece of rubber tubing to a horizontally clamped 0.1-cc. glass pipette calibrated in 0.01cc. divisions. The volume expelled was measured to the nearest 0.001 cc. by dividing the pipette divisions into 10 equal parts. The calibrated pipette was attached by a long piece of rubber tubing to a glass mouthpiece, and injection was made by oral pressure.

The injections were made through the coxa-femur conjunctiva of the left hind leg, the insect being held ventral side uppermost, and the needle being inserted cephalad along the coxa. After the injection each insect was retained for observation in an individual, small, wire-screen cage and was suplied with food and water continually until death or termination of the experiment. The criterion of death was failure to respond to pinching of the tarsi, antennae and cerci. Before injection the insect was weighed to the nearest 0.01 g. and the volume of solution to be injected was calculated at the rate of 0.05 cc. per 0.9 g. of body weight of the roach. Knowledge of the concentration of the solutions injected permitted calculation of the weight of fraction injected in mg. per g. of body weight.

The solutions of the alkaloid fractions were made up by weighing the samples to the nearest 0.002 mg., dissolving them in small volumes of 10 per cent acetic acid, nearly neutralizing with ammonium hydroxide with methyl red as indicator, and diluting to volume with distilled water. Control insects injected throughout the course of the experiments with a solution of acetic acid nearly neutralized with ammonium hydroxide showed no injurious effects beyond a temporary lameness in the injected leg. Equal numbers of males and females were used throughout to equalize possible sex differences in reaction.

Table 5.—Results of toxicological tests on the American cockroach of alkaloidal fractions obtained in the separation procedures.

Fraction	Dosage Mg./G.	No. Insects Injected	No. Insects Killed	Other Effects
Total alkaloids from assay	0.044	6	6	All knocked down; death in less than 96 hrs.
Precipitate **D**	0.044	10	1	7 knocked down; 3 partially paralyzed; death in less than 96 hrs.
Precipitate **E**	0.044	6	5	All knocked down; death in 24 hrs.
Aqueous filtrate **F**	—[1]	6	0	1 knocked down.
Precipitate **G**, crude jervine	0.044	6	0	No effect.
Precipitate **H**, crude pseudojervine	0.044	6	0	No effect.
Precipitate **J**, jervine	0.044	6	0	No effect.
Precipitate **K**, jervine	0.044	6	0	No effect.
Ether filtrate **L**	—[2]	6	6	All knocked down; 4 dead in less than 72 hrs., 2 in 149 hrs.
Fraction **M**	0.5	3	3	All knocked down; death in less than 19 hrs.
Fraction **M**	0.044	8	8	All knocked down; death in less than 72 hrs.
Fraction **M**	0.033	8	4	All knocked down; death in less than 72 hrs.
Fraction **M**	0.022	8	2	All knocked down; 2 deaths in 5 days.
Fraction **M**	0.011	8	0	All strongly agitated.
Fraction **M**	0.0044	4	0	All knocked down; up in 2 hrs.
Residue **P**	0.044	4	3	All knocked down; death in 72 hrs.
Residue **P**	0.022	4	3	All knocked down; death in 48 hrs.
Residue **P**	0.0044	4	0	All knocked down, 2 up in 2 hrs.

[1]This filtrate was injected without further treatment.
[2]Solvent evaporated from 1 cc. of filtrate, residue allowed to stand with dilute acetic acid, and decanted acid solution injected after partial neutralization.

Results and Discussion.—The data obtained in the injection tests with the alkaloid fractions obtained by the separation procedures are given in table 5. It is evident that the toxicity of the crude alkaloid mixture can be traced through a series of separations and found to reside chiefly in one or two individual fractions at the end of the series. The data on fractions **M** and **P** are of interest since they show how the procedures employed produced a concentration of the toxic components. The median lethal dose of **M** for the roach lay at about 0.033 mg. per g., while that of the concentrate, **P**, lay between 0.022 and 0.0044 mg. per g. From fraction **P**, a small amount of the alkaloid, protoveratridine, was crystallized. This alkaloid had been shown by Poethke (1937b) to be the partial hydrolysis product of germerine, highly toxic to vertebrate animals.

In table 6 are shown the data from toxicological tests on fraction **M'**, germine and cevine. Fraction **M'** was more toxic than the similar fraction **M** obtained in an earlier experiment by the same procedure, its median lethal dose being about 0.011 mg. per g. The toxicities of germine, which was isolated from fraction **M'**, and of cevine were compared since a chemical comparison of the two alkaloids had also been made. Germine, its median lethal dose about 0.26 mg. per g., was less toxic than cevine whose median lethal dose was about 0.088 mg. per g., and much less toxic than fraction **M'**. Germine had been shown by Poethke (1937b) to be the complete hydrolysis product of the toxic alkaloid, germerine.

These toxicological tests showed that jervine and pseudojervine, the predominant alkaloids of **Veratrum viride**, were nontoxic to roaches, and that germine, prepared from a highly toxic crude fraction, was also relatively nontoxic. These tests of the pure alkaloids on cockroaches are the first experiments on insects with pure alkaloids from the **Veratrum** spp., de-

Table 6.—Effect on the American cockroach of varying doses of fraction M', germine and cevine.

Material Tested Fraction	Dosage Mg./G.	No. Insects Injected	No. Insects Killed	Other Effects
Fraction **M'**	0.044	4	4	All knocked down; death in 48 hrs.
Fraction **M'**	0.022	4	4	All knocked down; death in 72 hrs.
Fraction **M'**	0.016	8	7	All knocked down; death in 72 hrs.
Fraction **M'**	0.011	16	7	All knocked down; death in 96 hrs.
Fraction **M'**	0.0044	8	1	All knocked down; 1 death in 5 days.
Germine	0.66	7	7	All knocked down; death in 96 hrs.
Germine	0.44	16	10	13 knocked down; death in 96 hrs.
Germine	0.264	16	7	11 knocked down; death in 6 days.
Germine	0.176	8	2	2 knocked down; death in 48 hrs.
Germine	0.044	4	0	No effect.
Cevine	0.176	8	8	All knocked down; death in 5 days.
Cevine	0.088	12	6	9 knocked down; 5 of dead were males; death in 72 hrs.
Cevine	0.066	8	4	7 knocked down; death in 72 hrs.
Cevine	0.044	4	1	2 knocked down; death in 7 days.

spite the fact that these plants have been known and used as insectides for a great length of time.

Conclusions.—1. The procedure for chemical determination of total alkaloid content of **Veratrum viride** has been modified to facilitate mechanical manipulation, to decrease the amount of nonalkaloidal impurities carried through the extraction procedure and to increase the precision of the determination.

2. The presence in **V. viride** of jervine, pseudojervine and rubijervine has been confirmed. Rubijervine was separated in very small amounts, but jervine and pseudojervine were the predominant alkaloids isolated from the plant.

3. Germerine and protoveratrine, alkaloids highly toxic to vertebrates, which have been isolated from the European species, **V. album,** could not be isolated from **V. viride,** the American species.

4. Protoveratridine in small amounts and germine in larger quantities, both hydrolysis products of germerine, were isolated for the first time from **V. viride.**

5. Germine resembled cevine, the hydrolysis product of cevadine and veratridine from sabadilla seeds, in chemical formula and many physical properties, but did not resemble it in chemical reactivity toward catalytic hydrogenation.

6. Jervine and pseudojervine were found to be nontoxic to the American cockroach.

7. Germine was somewhat toxic to the American cockroach, its median lethal dose being about 0.26 mg. per g.

8. The crude alkaloid fractions from which germine and protoveratridine were separated were highly toxic, indicating the possible existence in **V. viride** of some toxic alkaloid such as germerine.[1]—8-21.41.

[1]Acknowledgment. This is a publication from the Industrial Science Research Institute of Iowa State College. The writers are indebted to Dr. R. A. Fisher, formerly of the Department of Zoology and Entomology, Iowa State College, for his assistance in making some of the assay determinations.

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—Reprinted from Journal of Economic Entomology

Will Part of the Activities of the Fish and Wildlife Service Go Back to the Department of Agriculture?

Note: Such is the caption of an article that appeared in the May 21st issue of "Conservation News published by the National Wildlife Federation. The editors of Pests believe that the Pest Control Industry disapproves any such plan and favors continuance of the present arrangement. The article continues to say:

Two months ago companion bills were introduced in the House and Senate, which, if passed, would transfer certain fisheries, functions and services now carried on by the Fish and Wildlife Service in the Department of the Interior to the Department of Agriculture. Congressman Bates of Massachusetts introduced the bill in the House while Senator Pepper (Fla.) for himself, and Senators Brewster (Me.), Walsh (Mass.), Green R. I.), and Tydings (Md.) introduced it in the Senate.

It was less than two years ago now that the old Biological Survey and the Bureau of Fisheries were transferred from the Agriculture and Commerce Departments to Interior and merged into the Fish and Wildlife Service. Great opposition has developed to making any changes in this set-up now. As a matter of fact neither the Department of Agriculture nor Interior favors the proposal. Just why it has been advanced will probably be brought out at the hearings which are scheduled soon before the Merchant Marine and Fisheries Committee of the House, of which the Honorable Schuyler Bland is chairman. No hearings are scheduled in the Senate and with unfavorable reports from both Interior and Agriculture it is doubtful whether the bills will receive more than passing notice in Congress.

Rats by Air New Problem

U. S. Health Service Inspects Incoming Cargo Planes.

Washington—Two hitchhiking rats, found on planes from foreign ports, have been added to the United States Public Health service list of unwelcome visitors.

More than 14,000 returning planes have been inspected and only two rats found. But, says one health service official, the problem of keeping disease-bearing rodents from entering the United States may become more serious as huge new cargo ships go into service over great distances.

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NATIONAL PEST CONTROL ASSOCIATION

WHAT'S NEW IN PEST CONTROL-PERSONALS

Robert Laing, Jr.—Sadness has come to the home of the Laings of Cleveland, Ohio. The sudden death of Robert, Jr., came on June 1st. and funeral services took place on June 4th. The many friends express sincere sympathy to Mrs. Helen (Pat) Laing and her daughters, Barbara and Helen.

F. C. Sennewald, father of E. F. Sennewald of the St. Louis firm that bears his name, passed away on May 25th. Mr. Sennewald, Sr., was Vice-President of the Sennewald Drug Co. The Pest Control Industry expresses sincere sympathy.

J. T. BOONE has left the American Cyanamid & Chemical Co., N. Y., to accept a position as Sales Manager with the Animal Trap Company of America, Lititz, Pa. He was with the former concern for nine years, handling domestic sale of Cyanogas. To all PCOs and other members of the Pest Control Industry whose travels may take them out Lititz way, which, incidentally, in case you did not know, is but a few miles out of Lancaster and easily reached, "the latch string is always out," says Mr. Boone.

WRITES GILBERT STOVER, of the B. & B. Exterminators, Inc., Baltimore, Md. from Denver, Colo.: "Been hobnobbing with Maury Oser for a few days. Also talked with Walter McCloud while in Chicago." From which it is evident Gilbert and his family had a swell time on trip west, particularly since it was a reunion with their son in the Armed Forces. Subsequently we heard that Gilbert had no seat on the train for 162 miles.

BROWN-BANDED COCKROACH **(Supella supellectilium)** noted in Minnesota, according to a letter from Harold H. Shepard, Assistant Professor of Entomology, Department of Agriculture, University Farm, University of Minnesota, St. Paul, Minn., who writes: "I just ran across a note regarding the presence of the Brown-Banded Cockroach **(Supella supellectilium)** in Minnesota which I had intended transmitting to you sometime ago, thinking it would be of interest to readers of Pests. Our first and only specimen for the state was sent in on October 17, 1941 from Lester Prairie in McLeod County about fifty miles west of the Twin Cities."

"DRY DEATH" FOR INSECTS—A new chemical dust, inert, insoluble in water, nonpoisonous and free from danger of silicosis, has been developed in England to kill insects in grain and cereals. A fine, white inorganic powder, it does not adhere to the grain but kills the insects by desiccation—drying them to death.

WOOD-PRESERVING ARSENIC SALT: The Boliden mine located at Boliden, Sweden, produces more arsenic than any other mine in the world. The problem is to discover new uses for this poison, which at present is being stored unrefined. After the war the Boliden company hopes to sell to the world its wood-preserving arsenic salt, with which it believes it can make timber termite-proof. The Forest Products Laboratory in Madison, Wis., states the "Nation", is now testing this claim.

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Methyl bromide fumigation is suitable for dairy products. It is toxic to all forms of insect life, including cheese mite and cheese skipper, weevils and roaches and their eggs. It is effective at low temperatures, whereas many other fumigants become ineffective when the temperature drops.

Thanks to its penetrating power, it can be used satisfactorily in vaults, coolers, curing rooms, warehouses or factories tight enough to confine gas. No off-tastes or off-odors are introduced into the dairy products so fumigated.

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TIMELY LEAFLETS

For Victory gardeners who are experiencing trouble with rabbits, moles, field mice, pocket gophers, squirrels, birds and woodchucks, a handy leaflet is now available with advice regarding some methods of eradication.

The publication is entitled Wildlife Leaflet 236 and is obtainable from the United States Department of the Interior, Fish and Wildlife Service, Chicago.

FLIES, MICE, RATS AND POSSIBLY ANTS are important carriers of such diseases as typhoid, dysentery and salmonella infections, which do not affect the insects or animals themselves, according to an article by Dr. Joseph Felsen, director of laboratories and research at the Bronx Hospital, N. Y. C., in July, '43, Hygeia, entitled "Food, Fingers and Flies". He further states adequate screening or other mechanical protection and insect and rodent control are extremely important and that rodents are prolific sources of salmonella infection, contaminating food by their excreta. Flies, however, states Dr. Felsen, probably hold first place as agents for the spread of bacillary dysentery.

PENETRATING HEAT—When a doctor treats your aching joint by short-wave therapy you hold your hand or your foot in an electric field. Short-wave radio waves heat the joint, almost without your being aware of it. Other uses of short waves include the heat treatment of tobacco without removing it from the hogshead and the killing of insects in grains and cereals.

INSECTICIDE IN CHINESE YAM BEAN

Cornell University scientists have announced the discovery of a lethal insecticide, produced from the Chinese yam bean, which is cultivated in Central America and Mexico for the food value in its roots. Roy Hansberry, professor in the Agriculture Experiment Station at Ithaca, stated that this promises a nearby insecticide supply that may help to protect valuable vegetable crops in 1944. The active principle, which has been effective in killing pea aphids, Mexican bean beetles, and other pests, is concentrated in the seeds and is described as having many of the values of rotenone insecticides. The most effective use has been made by dusting with a mixture of ground seeds and talc.

'METHUSELAH' RAT KICKS THE BUCKET

ITHACA, N. Y.—Methuselah, a female rat which achieved an age equivalent in man to 145½ years, is dead.

Cornell University announced today that the rat, nationally known in connection with experiments on longevity being conducted by Dr. C. M. McCay, died last Saturday probably from lung trouble. It would have been four years old today.

REVENGE—The U. S. Bureau of Entomology, which controls insect pests, has been having a little trouble lately. Washington reports say roaches have been eating the Bureau's records. M.

Lincoln, Nebr.—Rats cost the average Nebraska farmer $50 a year. Don B. Whelan, entomologist at the college of agriculture, estimated that on Nebraska's 121,062 farms the annual toll taken by rats is $6,053,100.

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GAS—HOT OR COLD?

Bulletin discusses the question which arises occasionally as to the advantage of a "hot" gas over "cold" gas, the hot gas being represented as hydrocyanic acid generated by the pot method and the cold gas being represented by the "canned" product, for example in the form of Zyklon Discoids. Bulletin also contains some helpful notes on gas mask canisters and bedbugs.

WRITE PESTS, A-C-68.

DEODORANT

Catalog includes price data, etc., on deodorant which it is felt can neutralize and deodorize such toxic agents as Thanite, Lethane 384 Special, Velsicol, etc. Also contains data on perfume oils for sprays made with pyrethrum and kerosene.

WRITE PESTS—MAGNUS.

PIGEON-PROOFING

Folder describes pigeon-proofing invention which manufacturer claims will completely and decisively eliminate the pigeon nuisance. In use by real estate companies, churches, government buildings, etc.

WRITE PESTS—STANLEY.

THE ACTIVATING EFFORT OF PYRETHRUM UPON THE GERMAN COCKROACH

Research material prepared by John M. Hutzel, of the Ohio State University, Columbus, Ohio in cooperation with the Kenya Pyrethrum Extension Service, Inc., N. Y. Supervised by Professor F. L. Campbell.

WRITE PESTS—PYRETHRUM.

TERMITE CONTROL

Folder discusses concentrates available for two distinct methods of termite control: (1) treatment of timbers in place with an oil solution, and (2) treatment of all soil around an infested building or area with either an oil or water soluble chemical. Issuing company states it specializes in all problems concerning wood-destroying organisms and also wood preservation and invites your inquiries thereto.

WRITE PESTS—WOOD.

FUMIGATION SAFETY SUGGESTIONS

Of timely interest, in view of the at-hand fumigation season, is this bulletin which advocates as a safety measure the use of methyl orange-mercuric chloride test papers for the presence of HCN. It also discusses can openers for Zyklon Discoids, the need for adequate ventilation after fumigations, and gives a cautionary note on pilot lights in premises to be fumigated.

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FUMIGATION AND PLASTICS

News release discusses use-co-ordination of such diverse chemical products as plastics and fumigants in connection with infested bagged grain, seed, packaged or boxed foodstuffs. Methyl bromide-plastic-tarpaulin method of disinfestation described.

WRITE PESTS—DOW

ELECTRIC FANS

Bulletin discusses value of electric fans in connection with fumigation work, also some pertinent thoughts on the Schafer Prone Pressure Method of Resuscitation, etc.

WRITE PESTS—AC-69.

OUTLINE OF USES AND RECOMMENDATIONS FOR ROTENONE DUSTS AND SPRAYS

By W. J. Haude, Entomologist

The object of this memorandum is to summarize for insecticide manufacturers and other interested persons some of the more important agricultural uses of rotenone-bearing insecticides. In all cases recommendations are based on those emanating from official state and federal experiment stations unless otherwise noted.

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PYRETHRUM - DERRIS - RED SQUILL PRODUCTS

Leaflet describes foregoing insecticides with special bait chart for use in connection with powdered red squill.

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SOLVAY PRODUCTS

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BELLOWS

New-type bellows, made of materials non-essential to war effort, described in circular. Manufacturer states though no springs are used in the bellows they can be operated with one hand. They contain no valves and are quick-filling through the opening in the nozzle. Available in sizes for professional and resale purposes.

WRITE PESTS—CENTRO.

SODIUM SILICO FLUORIDE

Bulletin describes sodium silico fluoride product with proper density. Effective manner of testing for presence of HCN after ventilation also discussed.

WRITE PESTS—AC 70.

RECHARGEABLE STORAGE FLASHLIGHT BATTERIES

Literature describes permanent type of rechargeable flashlight battery which eliminates worry about a dry cell shortage, due to the use of critical materials, and can, it is stated, equal in use as many as 400 or more dry cells. Instead of constantly using new cells and throwing them away, you simply recharge the battery and it's "just like new" again, manufacturer states. The addition of a few drops of distilled water and regular charging is all that is necessary for an unlimited amount of bright, steady light.

WRITE PESTS—IDEAL.

HOUSEHOLD SPRAY FACTS

Manufacturer's bulletin discusses Lethane's killing power, range of insect control, cost, chemical stability, spray formulas, etc.

WRITE PESTS—ROHM & HAAS.

MOLE KILLER PELLETS

Circular describes mole killer pellets which manufacturer states requires no traps, no gas, no exposed poison. Diagram of runways and explains how mole lives. Testimonial letters.

WRITE PESTS—CARAJON.

FUMIGATION NOTES:

Discusses spread of Discoids; reinfestation; effects on vegetables and eggs.

WRITE PESTS, AC58.

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